

AN INTRODUCTORY ARITHMETIC

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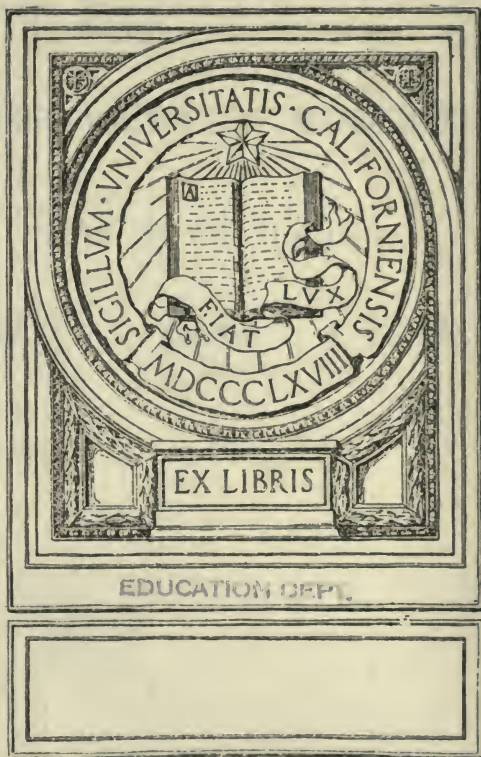
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The Sensenig-Anderson Series of Arithmetics

AN

INTRODUCTORY ARITHMETIC

BY

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AND

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The Sensenig-Anderson Series of Arithmetics

By **DAVID M. SENSENIG, M.S.**, and **ROBERT F. ANDERSON, A.M.**, Instructors in Mathematics,
State Normal School, West Chester, Pennsylvania.

AN INTRODUCTORY ARITHMETIC. A first book in arithmetic, inductive in method and carefully graded, developing the subjects by natural steps. It gives the pupil an intelligent understanding of processes and abundant practice in operations. 262 pp.

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PREFACE.

IN this volume the authors assume that the pupil can read easy sentences and that he has had at least one year of number work.

The aim of Chapter I. is to develop easily and naturally the idea of number without making use of elaborate pictures; to provide numerous exercises, both oral and written, by means of which the pupil may become proficient in forming, writing, and reading numbers, and in the fundamental operations; to furnish him with such suggestions and solutions as will make each step in his progress intelligible to him.

Other important features of the book are:

1. The inductive methods employed in leading the pupil by logical questions to the fundamental conceptions of every subject.
2. The use of simple diagrams, easily constructed by the pupil himself, for purposes of illustration.
3. Carefully graded concrete problems, involving only such terms as the pupil is supposed to be familiar with. In other words, the authors have endeavored to keep within the field of the pupil's experience.

4. The separation of the process of finding one of the equal parts of a number, *Division*, and of finding how many times one number contains another as a unit of measure, *Mensuration*. Division as usually treated involves two cases so obviously different in their nature that they ought to be considered separate processes under appropriate names. The process of separating a number into a number of equal parts to determine one of these parts is properly named Division. The process of determining how many times one number contains another as a unit of measure, which is generally called division, is primarily finding the relation which one number bears to another taken as a unit of measure; this is simply *measuring* one number by another, and is properly named Mensuration.

5. A simple treatment of Percentage, Interest, and Business Forms, introduced to meet the demands of such pupils as are compelled to leave school at an early age.

DAVID M. SENSENIG.

ROBERT F. ANDERSON.

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An Introductory Arithmetic.

CHAPTER I.

WHOLE NUMBERS AND FRACTIONAL PARTS OF WHOLE NUMBERS.

Forming, Writing, and Reading Numbers to 10;
Addition and Subtraction.

1. Oral Exercise.

How many dots are there in this square ?



The figure **1** stands for **one**.

How many are 1 and 1 ?



The figure **2** stands for **two**.

How many are 2 and 1 ? 1 and 2 ?



The figure **3** stands for **three**.

How many are 3 and 1 ? 1 and 3 ?



How many are 2 and 2 ?



The figure **4** stands for **four**.

2. WHOLE NUMBERS AND FRACTIONAL PARTS.

How many are 4 and 1? 1 and 4?



How many are 3 and 2? 2 and 3?



The figure 5 stands for **five**.

How many are 5 and 1? 1 and 5?



How many are 4 and 2? 2 and 4?



How many are 3 and 3?



The figure 6 stands for **six**.

How many are 6 and 1? 1 and 6?



How many are 5 and 2? 2 and 5?



How many are 4 and 3? 3 and 4?



The figure 7 stands for **seven**.

How many are 7 and 1? 1 and 7?



How many are 6 and 2? 2 and 6?



How many are 5 and 3? 3 and 5?



How many are 4 and 4?



The figure 8 stands for **eight**.

How many are 8 and 1 ? 1 and 8 ?



How many are 7 and 2 ? 2 and 7 ?



How many are 6 and 3 ? 3 and 6 ?



How many are 5 and 4 ? 4 and 5 ?



The figure 9 stands for **nine**.

2 pins and 2 pins are how many pins ?



How many marbles are 3 marbles and 2 marbles ?

2 pears and 3 pears are how many pears ?

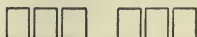


4 rings and 2 rings are how many rings ?

How many pies are 2 pies and 4 pies ?



How many cards are 3 cards and 3 cards ?



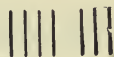
5 balls and 2 balls are how many balls ?

2 oranges and 5 oranges are how many oranges ?



How many pencils are 4 pencils and 3 pencils ?

3 girls and 4 girls are how many girls ?





6 crosses and 2 crosses are how many crosses ?

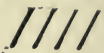

2 poles and 6 poles are how many poles ?



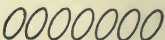

4. WHOLE NUMBERS AND FRACTIONAL PARTS.

5 books and 3 books are how many books?

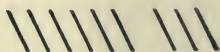
How many letters are 3 letters and  
5 letters?

How many fingers are 4 fingers and 4  
fingers?

7 stamps and 2 stamps are how many stamps?



How many beans are 2 beans and 7  
beans?

6 apples and 3 apples are how many
apples?



How many tops are 3 tops and 6 tops?

How many logs are 5 logs and 4 logs?

How many beads are 4 beads and 5 beads?  

2. The sign $+$ stands for the word *and*.

The sign $=$ stands for *are* or *is*.

Thus, 2 and 1 are 3 may be written $2 + 1 = 3$.

3. Oral Exercise.

Read :

$$1 + 1 = 2$$

$$3 + 1 = 4$$

$$4 + 1 = 5$$

$$1 + 2 = 3$$

$$1 + 3 = 4$$

$$1 + 4 = 5$$

$$2 + 2 = 4$$

$$3 + 2 = 5$$

$$5 + 1 = 6$$

4. Exercise.

Copy, writing the proper figures in place of the dots:

$1 + 1 = .$	$4 + 2 = .$	$2 + 6 = .$
$2 + 1 = .$	$2 + 4 = .$	$5 + 3 = .$
$1 + 2 = .$	$3 + 3 = .$	$3 + 5 = .$
$3 + 1 = .$	$6 + 1 = .$	$4 + 4 = .$
$1 + 3 = .$	$1 + 6 = .$	$8 + 1 = .$
$2 + 2 = .$	$5 + 2 = .$	$1 + 8 = .$
$4 + 1 = .$	$2 + 5 = .$	$7 + 2 = .$
$1 + 4 = .$	$4 + 3 = .$	$2 + 7 = .$
$3 + 2 = .$	$3 + 4 = .$	$6 + 3 = .$
$2 + 3 = .$	$7 + 1 = .$	$3 + 6 = .$
$5 + 1 = .$	$1 + 7 = .$	$5 + 4 = .$
$1 + 5 = .$	$6 + 2 = .$	$4 + 5 = .$

5. Oral Exercise.

Read Exercise 4, supplying the missing numbers.

6. Exercise.

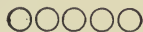
Copy, writing in each case the proper figure in place of the dash :

2 men + — men = 4 men.



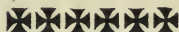
3 women + — women = 5 women.

2 boys + — boys = 5 boys.



4 girls + — girls = 6 girls.

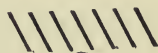
2 horses + — horses = 6 horses.



3 cows + — cows = 6 cows.

5 mules + — mules = 7 mules.

2 goats + — goats = 7 goats.



4 kittens + — kittens = 7 kittens.

3 hens + — hens = 7 hens.

6 ducks + — ducks = 8 ducks.

2 geese + — geese = 8 geese.

5 turkeys + — turkeys = 8 turkeys. ●●●●●●●●

3 crows + — crows = 8 crows.

4 wrens + — wrens = 8 wrens.

7 robins + — robins = 9 robins.

2 doves + — doves = 9 doves.

6 jays + — jays = 9 jays. ●●●●●●●●●●

3 sparrows + — sparrows = 9 sparrows.

5 parrots + — parrots = 9 parrots.

4 larks + — larks = 9 larks.

7. Exercise.

Copy, writing the proper figure in place of the dots :

$1 + \cdot = 2$

$4 + \cdot = 6$

$2 + \cdot = 8$

$2 + \cdot = 3$

$2 + \cdot = 6$

$5 + \cdot = 8$

$1 + \cdot = 3$

$3 + \cdot = 6$

$3 + \cdot = 8$

$3 + \cdot = 4$

$6 + \cdot = 7$

$4 + \cdot = 8$

$1 + \cdot = 4$

$1 + \cdot = 7$

$8 + \cdot = 9$

$2 + \cdot = 4$

$5 + \cdot = 7$

$1 + \cdot = 9$

$4 + \cdot = 5$

$2 + \cdot = 7$

$7 + \cdot = 9$

$1 + \cdot = 5$

$4 + \cdot = 7$

$2 + \cdot = 9$

$3 + \cdot = 5$

$3 + \cdot = 7$

$6 + \cdot = 9$

$2 + \cdot = 5$

$7 + \cdot = 8$

$3 + \cdot = 9$

$5 + \cdot = 6$

$1 + \cdot = 8$

$5 + \cdot = 9$

$1 + \cdot = 6$

$6 + \cdot = 8$

$4 + \cdot = 9$

8. Oral Exercise.

Read Exercise 7, supplying the missing numbers.

9. Exercise.

Copy, writing in each case the proper figure in place of the dash :

— birds + 2 birds = 4 birds.



— mice + 2 mice = 5 mice.

— rats + 3 rats = 5 rats.



— bugs + 2 bugs = 6 bugs.

— flies + 4 flies = 6 flies.

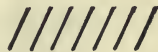
— fishes + 3 fishes = 6 fishes.



— lambs + 2 lambs = 7 lambs.

— trees + 5 trees = 7 trees.

— shrubs + 3 shrubs = 7 shrubs.



— pinks + 4 pinks = 7 pinks.

— daisies + 2 daisies = 8 daisies.

— buds + 6 buds = 8 buds.

— leaves + 3 leaves = 8 leaves.



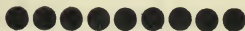
— roses + 5 roses = 8 roses.

— violets + 4 violets = 8 violets.

— cars + 2 cars = 9 cars.

— carts + 7 carts = 9 carts.

— ships + 3 ships = 9 ships.



— boats + 6 boats = 9 boats.

— bricks + 4 bricks = 9 bricks.

— stones + 5 stones = 9 stones.

10. Exercise.

Copy, writing the proper figures in place of the dots :

• + 1 = 2	• + 2 = 6	• + 6 = 8
• + 1 = 3	• + 4 = 6	• + 3 = 8
• + 2 = 3	• + 3 = 6	• + 5 = 8
• + 1 = 4	• + 1 = 7	• + 4 = 8
• + 3 = 4	• + 6 = 7	• + 1 = 9
• + 2 = 4	• + 2 = 7	• + 8 = 9
• + 1 = 5	• + 5 = 7	• + 2 = 9
• + 4 = 5	• + 3 = 7	• + 7 = 9
• + 2 = 5	• + 4 = 7	• + 3 = 9
• + 3 = 5	• + 1 = 8	• + 6 = 9
• + 1 = 6	• + 7 = 8	• + 4 = 9
• + 5 = 6	• + 2 = 8	• + 5 = 9

11. Oral Exercise.

Read Exercise 10, supplying the missing numbers.

12. Oral Exercise.

Read, supplying the missing numbers :

4 nails less 2 nails are — nails.



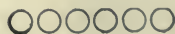
5 grains of corn less 2 grains of corn are — grains of corn.

5 pods less 3 pods are — pods.



6 spoons less 2 spoons are — spoons.

6 forks less 4 forks are — forks.



6 cups less 3 cups are — cups.

7 knives less 2 knives are — knives.

7 spoons less 5 spoons are — spoons.



7 fishes less 3 fishes are — fishes.

7 eels less 4 eels are — eels.

8 cents less 2 cents are — cents.

8 dollars less 6 dollars are — dollars.

8 cars less 3 cars are — cars.

XXXXXXXXXX

8 carts less 5 carts are — carts.

9 cards less 2 cards are — cards.

9 spools less 7 spools are — spools. ●●●●●●●●●

9 matches less 3 matches are — matches.

9 brooms less 6 brooms are — brooms.

9 turkeys less 4 turkeys are — turkeys.

9 chairs less 5 chairs are — chairs.

13. The sign — stands for the word *less*.

Thus, 6 less 4 are 2 may be written $6 - 4 = 2$.

14. Oral Exercise.

Read :

$$2 - 1 = 1$$

$$4 - 1 = 3$$

$$5 - 1 = 4$$

$$3 - 1 = 2$$

$$4 - 2 = 2$$

$$5 - 2 = 3$$

$$3 - 2 = 1$$

$$4 - 3 = 1$$

$$5 - 3 = 2$$

15. Exercise.

Copy, writing the proper figures in place of the dots :

$$2 - 1 = .$$

$$5 - 4 = .$$

$$6 - 3 = .$$

$$3 - 1 = .$$

$$5 - 2 = .$$

$$7 - 1 = .$$

$$3 - 2 = .$$

$$5 - 3 = .$$

$$7 - 6 = .$$

$$4 - 1 = .$$

$$6 - 1 = .$$

$$7 - 2 = .$$

$$4 - 3 = .$$

$$6 - 5 = .$$

$$7 - 5 = .$$

$$4 - 2 = .$$

$$6 - 2 = .$$

$$7 - 3 = .$$

$$5 - 1 = .$$

$$6 - 4 = .$$

$$7 - 4 = .$$

10 WHOLE NUMBERS AND FRACTIONAL PARTS.

$8 - 1 = \cdot$

$8 - 5 = \cdot$

$9 - 7 = \cdot$

$8 - 7 = \cdot$

$8 - 4 = \cdot$

$9 - 3 = \cdot$

$8 - 2 = \cdot$

$9 - 1 = \cdot$

$9 - 6 = \cdot$

$8 - 6 = \cdot$

$9 - 8 = \cdot$

$9 - 4 = \cdot$

$8 - 3 = \cdot$

$9 - 2 = \cdot$

$9 - 5 = \cdot$

16. Oral Exercise.

Read Exercise 15, supplying the missing numbers.

17. Oral Exercise.

How many stars are 2 stars and 2 stars ?

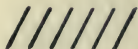
How many more than 2 dots are 4 dots ?

How many rings are 3 rings and 2 rings ?

How many squares must be put with 3 squares to make 5 squares ?

How many more than 2 blocks are 5 blocks ?

How many strokes are here ?



If you take away 4 strokes, how many will be left ?

How many more than 2 strokes are here ?

How many more than 3 strokes are here ?

Read, supplying the missing numbers :

$4 + \cdot = 6$

$6 - 4 = \cdot$

$6 - \cdot = 4$

$2 + \cdot = 6$

$6 - 2 = \cdot$

$6 - \cdot = 2$

$3 + \cdot = 6$

$6 - 3 = \cdot$

$6 - \cdot = 3$

How many squares are here ? ☐ ☐ ☐ ☐ ☐ ☐ ☐

How many more than 5 squares are 7 squares ?

How many squares must you put with two squares to make 7 squares ?

If you take away 4 squares, how many will be left ?

How many more than 3 squares are 7 squares ?


Read, supplying the missing numbers :

$$5 + \cdot = 7 \qquad 7 - 5 = \cdot \qquad 7 - \cdot = 5$$

$$2 + \cdot = 7 \qquad 7 - 2 = \cdot \qquad 7 - \cdot = 2$$

$$4 + \cdot = 7 \qquad 7 - 4 = \cdot \qquad 7 - \cdot = 4$$

$$3 + \cdot = 7 \qquad 7 - 3 = \cdot \qquad 7 - \cdot = 3$$

How many rings are here ? 

How many more than 6 rings are 8 rings ?

How many rings must you put with 2 rings to make 8 rings ?

If you take 3 rings from 8 rings, how many will be left ?

How many more than 3 rings are 8 rings ?

How many rings must you put with 4 rings to make 8 rings ?


Read, supplying the missing numbers :

$$6 + \cdot = 8 \qquad 4 + \cdot = 8 \qquad 8 - 3 = \cdot$$

$$2 + \cdot = 8 \qquad 8 - 6 = \cdot \qquad 8 - 4 = \cdot$$

$$5 + \cdot = 8 \qquad 8 - 2 = \cdot \qquad 8 - \cdot = 5$$

$$3 + \cdot = 8 \qquad 8 - 5 = \cdot \qquad 8 - \cdot = 3$$

How many crosses are here ? 

How many more than 7 crosses are here ?

How many crosses must you put with 2 crosses to make 9 crosses ?

If you take 6 crosses from 9 crosses, how many will be left ?

How many more than 3 crosses are 9 crosses ?

12 WHOLE NUMBERS AND FRACTIONAL PARTS

How many more than 5 crosses are 9 crosses ?

If 5 crosses are taken from 9 crosses, how many are left ?

Read, supplying the missing numbers :

$$7 + \cdot = 9$$

$$9 - 7 = \cdot$$

$$9 - \cdot = 7$$

$$2 + \cdot = 9$$

$$9 - 2 = \cdot$$

$$9 - \cdot = 2$$

$$6 + \cdot = 9$$

$$9 - 6 = \cdot$$

$$9 - \cdot = 6$$

$$3 + \cdot = 9$$

$$9 - 3 = \cdot$$

$$9 - \cdot = 3$$

$$5 + \cdot = 9$$

$$9 - 5 = \cdot$$

$$9 - \cdot = 5$$

$$4 + \cdot = 9$$

$$9 - 4 = \cdot$$

$$9 - \cdot = 4$$

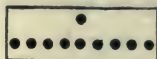
Forming, Writing, and Reading Numbers from 10 to 20; Addition and Subtraction.

18. Oral Exercise.

How many are 9 and 1 ?

Ten ones make a ten.

Ten is written 10.



How many are 10 and 1 ?

Eleven is written 11.



How many are 10 and 2 ?

Twelve is written 12.



How many are 10 and 3 ?

Thirteen is written 13.



How many are 10 and 4 ?

Fourteen is written 14.



How many are 10 and 5 ?

Fifteen is written 15.



How many are 10 and 6 ?

Sixteen is written 16.



How many are 10 and 7 ?

Seventeen is written 17.



How many are 10 and 8 ?

Eighteen is written 18.



How many are 10 and 9 ?

Nineteen is written 19.



19. Oral Exercise.

Read, supplying the missing numbers :

2 beans and 8 beans are — beans.

4 pears and 6 pears are — pears.

3 cherries and 8 cherries are — cherries.

5 berries and 5 berries are — berries.

4 lemons and 7 lemons are — lemons.

5 figs and 6 figs are — figs.

3 pies and 7 pies are — pies.

2 apples and 9 apples are — apples.

5 grapes and 7 grapes are — grapes.

4 plums and 8 plums are — plums.

5 rings and 8 rings are — rings.

6 pens and 6 pens are — pens.

14 WHOLE NUMBERS AND FRACTIONAL PARTS.

3 cakes and 9 cakes are — cakes.

6 rolls and 8 rolls are — rolls.

5 hawks and 9 hawks are — hawks.

7 crabs and 8 crabs are — crabs.

4 rails and 9 rails are — rails.

6 posts and 7 posts are — posts.

8 boards and 9 boards are — boards.

6 screws and 9 screws are — screws.

7 saws and 7 saws are — saws.

8 houses and 8 houses are — houses.

7 cans and 9 cans are — cans.

9 strings and 9 strings are — strings.

9 caps and 10 caps are — caps.

20. Exercise.

Copy, writing the proper figures in place of the dots :

$$9 + 1 = . \quad 8 + 2 = . \quad 7 + 3 = .$$

$$6 + 4 = . \quad 5 + 5 = . \quad 9 + 2 = .$$

$$8 + 3 = . \quad 7 + 4 = . \quad 6 + 5 = .$$

$$9 + 3 = . \quad 8 + 4 = . \quad 7 + 5 = .$$

$$6 + 6 = . \quad 9 + 4 = . \quad 8 + 5 = .$$

$$7 + 6 = . \quad 9 + 5 = . \quad 8 + 6 = .$$

$$7 + 7 = . \quad 9 + 6 = . \quad 8 + 7 = .$$

$$9 + 7 = . \quad 8 + 8 = . \quad 9 + 8 = .$$

$$9 + 9 = . \quad 10 + 8 = . \quad 10 + 9 = .$$

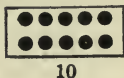
21. Oral Exercise.

Read Exercise 20, supplying the missing numbers.

22. Oral Exercise.

1 star and how many stars are 10 stars ?

5 buttons and how many buttons are 10 buttons ?



2 mugs and how many mugs are 10 mugs ?

4 boxes and how many boxes are 10 boxes ?

3 dimes and how many dimes are 10 dimes ?

2 bricks and how many bricks are 11 bricks ?

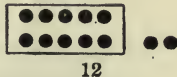


5 ribbons and how many ribbons are 11 ribbons ?

3 tacks and how many tacks are 11 tacks ?

4 tubs and how many tubs are 11 tubs ?

3 ropes and how many ropes are 12 ropes ?

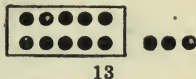


6 caps and how many caps are 12 caps ?

4 rugs and how many rugs are 12 rugs ?

5 lamps and how many lamps are 12 lamps ?

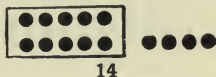
4 globes and how many globes are 13 globes ?



6 maps and how many maps are 13 maps ?

5 slates and how many slates are 13 slates ?

5 pencils and how many pencils are 14 pencils ?

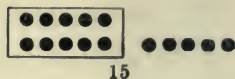


7 crayons and how many crayons are 14 crayons ?

6 chains and how many chains are 14 chains ?

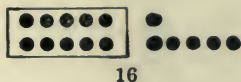
16 WHOLE NUMBERS AND FRACTIONAL PARTS.

6 blocks and how many blocks
are 15 blocks ?



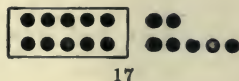
7 buttons and how many buttons
are 15 buttons ?

7 hooks and how many hooks are
16 hooks ?

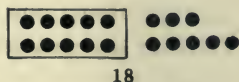


8 papers and how many papers are 16 papers ?

8 plants and how many plants are
17 plants ?

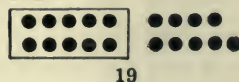


9 acorns and how many acorns are
18 acorns ?



10 chestnuts and how many chest-
nuts are 18 chestnuts ?

10 walnuts and how many walnuts
are 19 walnuts ?



23. Exercise.

Copy, writing the proper figures in place of dots :

$$9 + \cdot = 10$$

$$9 + \cdot = 12$$

$$8 + \cdot = 14$$

$$5 + \cdot = 10$$

$$6 + \cdot = 12$$

$$9 + \cdot = 15$$

$$8 + \cdot = 10$$

$$8 + \cdot = 12$$

$$8 + \cdot = 15$$

$$6 + \cdot = 10$$

$$7 + \cdot = 12$$

$$9 + \cdot = 16$$

$$7 + \cdot = 10$$

$$9 + \cdot = 13$$

$$8 + \cdot = 16$$

$$9 + \cdot = 11$$

$$7 + \cdot = 13$$

$$9 + \cdot = 17$$

$$6 + \cdot = 11$$

$$8 + \cdot = 13$$

$$9 + \cdot = 18$$

$$8 + \cdot = 11$$

$$9 + \cdot = 14$$

$$8 + \cdot = 18$$

$$7 + \cdot = 11$$

$$7 + \cdot = 14$$

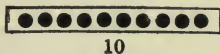
$$9 + \cdot = 19$$

24. Oral Exercise.

Read Exercise 23, supplying the missing numbers.

25. Oral Exercise.

How many melons and 5 melons are
10 melons?



How many lemons and 2 lemons are 10 lemons?

How many shrubs and 4 shrubs are 10 shrubs?

How many baskets and 3 baskets are 10 baskets?

How many dots and 2 dots are 11 dots?

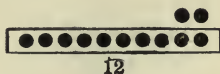


How many trees and 5 trees are 11
trees?

How many ducks and 4 ducks are 11 ducks?

How many geese and 3 geese are 11 geese?

How many bears and 3 bears are 12
bears?

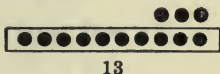


How many camels and 6 camels are 12 camels?

How many monkeys and 4 monkeys are 12 monkeys?

How many lions and 5 lions are 12 lions?

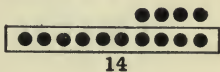
How many deer and 4 deer are 13
deer?



How many goats and 6 goats are 13 goats?

How many rabbits and 5 rabbits are 13 rabbits?

How many owls and 7 owls are 14
owls?

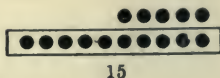


How many bats and 5 bats are 14 bats?

How many minks and 6 minks are 14 minks?

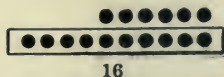
18 WHOLE NUMBERS AND FRACTIONAL PARTS.

How many flags and 6 flags are 15 flags ?



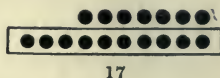
How many hoops and 8 hoops are 15 hoops ?

How many wheels and 8 wheels are 16 wheels ?



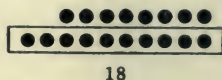
How many spokes and 7 spokes are 16 spokes ?

How many trout and 8 trout are 17 trout ?



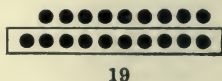
How many frogs and 7 frogs are 17 frogs ?

How many shingles and 8 shingles are 18 shingles ?



How many nails and 9 nails are 18 nails ?

How many wheels and 9 wheels are 19 wheels ?



26. Exercise.

Copy, writing the proper figures in place of dots :

$$\cdot + 9 = 10$$

$$\cdot + 9 = 12$$

$$\cdot + 8 = 14$$

$$\cdot + 5 = 10$$

$$\cdot + 6 = 12$$

$$\cdot + 9 = 15$$

$$\cdot + 8 = 10$$

$$\cdot + 8 = 12$$

$$\cdot + 8 = 15$$

$$\cdot + 6 = 10$$

$$\cdot + 7 = 12$$

$$\cdot + 9 = 16$$

$$\cdot + 7 = 10$$

$$\cdot + 9 = 13$$

$$\cdot + 8 = 16$$

$$\cdot + 9 = 11$$

$$\cdot + 7 = 13$$

$$\cdot + 9 = 17$$

$$\cdot + 6 = 11$$

$$\cdot + 8 = 13$$

$$\cdot + 9 = 18$$

$$\cdot + 8 = 11$$

$$\cdot + 9 = 14$$

$$\cdot + 10 = 18$$

$$\cdot + 7 = 11$$

$$\cdot + 7 = 14$$

$$\cdot + 9 = 19$$

27. Oral Exercise.

Read Exercise 26, supplying the missing numbers.

28. Oral Exercise.

Read, supplying the missing numbers :

10 horses less 1 horse are — horses.

10 cows less 6 cows are — cows.

10 calves less 8 calves are — calves.

10 mules less 2 mules are — mules.

10 sheep less 7 sheep are — sheep.

10 goats less 4 goats are — goats.

10 pigs less 9 pigs are — pigs.

10 birds less 5 birds are — birds.

10 geese less 3 geese are — geese.

11 ducks less 2 ducks are — ducks.

11 carts less 5 carts are — carts.

11 coats less 8 coats are — coats.

11 vests less 3 vests are — vests.

11 hats less 6 hats are — hats.

11 caps less 4 caps are — caps.

11 collars less 7 collars are — collars.

11 buttons less 9 buttons are — buttons.

12 pins less 3 pins are — pins.

12 needles less 6 needles are — needles.

12 skates less 8 skates are — skates.

12 plows less 5 plows are — plows.

12 wheels less 4 wheels are — wheels.

12 rings less 7 rings are — rings.

12 cuffs less 9 cuffs are — cuffs.



13 matches less 4 matches are — matches.

13 lamps less 6 lamps are — lamps.

13 cars less 8 cars are — cars.

13 boys less 5 boys are — boys.



13 girls less 7 girls are — girls.

13 women less 9 women are — women.

14 dogs less 5 dogs are — dogs.

14 cats less 8 cats are — cats.

14 mice less 6 mice are — mice.



14 birds less 9 birds are — birds.

14 flowers less 7 flowers are — flowers.

15 houses less 6 houses are — houses.



15 boards less 8 boards are — boards.

15 shingles less 9 shingles are — shingles.

15 bricks less 7 bricks are — bricks.

16 slates less 7 slates are — slates.



16 pencils less 9 pencils are — pencils.

16 buds less 8 buds are — buds.

17 twigs less 8 twigs are — twigs.



17 trees less 9 trees are — trees.

18 shrubs less 9 shrubs are — shrubs.

29. Exercise.

Copy, writing the proper figures in place of dots :

$$10 - 1 = \cdot \quad 10 - 7 = \cdot \quad 11 - 9 = \cdot$$

$$10 - 9 = \cdot \quad 10 - 4 = \cdot \quad 11 - 3 = \cdot$$

$$10 - 2 = \cdot \quad 10 - 6 = \cdot \quad 11 - 8 = \cdot$$

$$10 - 8 = \cdot \quad 10 - 5 = \cdot \quad 11 - 4 = \cdot$$

$$10 - 3 = \cdot \quad 11 - 2 = \cdot \quad 11 - 7 = \cdot$$

$11 - 5 = .$	$13 - 9 = .$	$15 - 6 = .$
$11 - 6 = .$	$13 - 5 = .$	$15 - 9 = .$
$12 - 3 = .$	$13 - 8 = .$	$15 - 7 = .$
$12 - 9 = .$	$13 - 6 = .$	$15 - 8 = .$
$12 - 4 = .$	$13 - 7 = .$	$16 - 7 = .$
$12 - 8 = .$	$14 - 5 = .$	$16 - 9 = .$
$12 - 5 = .$	$14 - 9 = .$	$16 - 8 = .$
$12 - 7 = .$	$14 - 6 = .$	$17 - 8 = .$
$12 - 6 = .$	$14 - 8 = .$	$17 - 9 = .$
$13 - 4 = .$	$14 - 7 = .$	$18 - 9 = .$

30. Oral Exercise.

Read Exercise 29, supplying the missing numbers.

31. If we count 3 to 4, we have 7.

Counting 3 to 4 is called *adding* 3 to 4.

32. Oral Exercise.

2	4	1	3	6	5	8	7	9
---	---	---	---	---	---	---	---	---

To each of the numbers above the line:

- | | |
|-----------|--|
| 1. Add 1. | Thus, 2 and 1 are 3, 4 and 1 are 5, and so on. |
| 2. Add 2. | 4. Add 4. 6. Add 6. 8. Add 8. |
| 3. Add 3. | 5. Add 5. 7. Add 7. 9. Add 9. |

33. Oral Exercise.

To the teacher.—Teach Roman notation to XIX. Teach United States coin to one dollar.

1. Charles had 2 goldfish and his uncle gave him 3 more ; how many had he then ?

22 WHOLE NUMBERS AND FRACTIONAL PARTS.

2. Sara found 3 eggs in one nest and 4 in another ; how many did she find in all ?

3. Mr. Rice has 2 sons and 4 daughters ; how many children has he ?

4. A farmer had 4 sheep and bought 5 more ; how many had he then ?

5. James is 2 years older than Mary ; if Mary is 6 years old, how old is James ?

6. How many lambs had a farmer at first, if he had 5 left after selling 6 ?

7. Jane spelled 6 words correctly and missed 4 ; how many was she given to spell ?

8. How many horses has a man, if he keeps 3 to drive and 6 to work ?

9. Harry has walked 4 miles toward home and has 7 miles yet to go ; how far from home was he when he started ?

10. How many animals did a blacksmith shoe to-day, if he shod 7 horses and 5 mules ?

11. How many boys were there at first in a class, if 7 remained after 3 were promoted ?

12. How many policemen must be on duty so that when 4 go home 8 remain ?

10 cents make 1 dime.

13. 1 cent and how many cents make a dime ?

14. A dime is how much more than a 5-cent piece ?

15. A dime and a cent make how much ?

16. A dime and a 5-cent piece make how much ?

17. A dime, a cent, and a 5-cent piece make how much ?

18. A dime is worth how many 5-cent pieces ?

19. A cent and a 5-cent piece are together worth how much less than a dime ?

34. Exercise.

To the teacher.—Let the pupil solve problems in Exercises orally when possible.

1. There are 3 persons in a boat that will carry 8 persons ; how many more may get in ?

2. I found 6 eggs ; how many more must I get to have 12 ?

7 days make 1 week.

3. Name the days of the week.

4. Name the first day of the week ; the third ; the second ; the fourth ; the sixth ; the fifth ; the seventh.

5. Last week father worked 4 days ; how many days was he idle ?

6. A man owns 6 horses ; how many more must he buy to have 14 ?

7. Samuel has spent 2 days with his cousin ; how long has he yet to stay, if his visit is to last a week ?

8. Mother put up 17 cans of fruit to-day ; 8 of them were pears and the others peaches ; how many were peaches ?

9. I had to write 16 words ; I have written 7 of them ; how many have I yet to write ?

10. My uncle wishes to have 12 cows; he now has 5; how many more must he get?

11. A boy paid 10 cents for a loaf of bread and a pound of sugar. If the sugar cost 6 cents, what did the loaf of bread cost?

12. How many days of the week are left after Wednesday has passed?

35. If we take 3 from 7, we have 4.

Taking 3 from 7 is called *subtracting* 3 from 7.

36. Oral Exercise.

Subtract :

1. 2 from

2 4 3 6 9 5 8 10 7 11

Thus, 2 from 2 leaves 0, 2 from 4 leaves 2, and so on.

2. 3 from

3 6 4 9 5 8 12 10 7 11

3. 4 from

7 5 6 4 12 8 11 9 13 10

4. 5 from

8 5 6 12 14 11 9 13 10 7

5. 6 from

8 10 6 9 12 7 14 11 13 15

6. 7 from

8 10 9 7 12 14 11 16 13 15

7. 8 from

10 12 14 16 8 9 11 13 15 17

8. 9 from

11 13 9 12 16 10 14 17 15 18

37. Oral Exercise.

1. Mary saw 8 stars, but a cloud now covers 3 of them ; how many can she still see ?

2. There were 7 houses in a row, but a fire burned 3 of them ; how many were then left ?

3. A gardener planted 9 trees, but 4 of them died ; how many lived ?

4. A farmer had 11 colts, but sold 5 of them ; how many had he left ?

5. 9 boys were examined ; if 5 of them failed, how many passed ?

6. Amos had 10 problems to solve ; if he has solved 3, how many has he yet to solve ?

7. There were 12 women in a parlor, but 4 of them went away ; how many remained ?

8. A woman bought 12 eggs, and cooked 6 of them for supper ; how many had she left ?

12 is called a dozen (doz.).

9. A man bought a dozen oranges and ate 3 of them ; how many had he left ?

10. A lady bought a dozen ears of corn and cooked 8 of them for dinner ; how many had she left ?

11. James planted 15 ferns, but only 9 of them lived ; how many died ?

12. A boy had 10 firecrackers and shot off 6 of them ; how many had he then left ?

33. Oral Exercise.

1. A farmer had 9 lambs; if he sold all but 2, how many did he sell?

2. A newsboy bought 15 morning papers and sold all but 6; how many did he sell?

3. Jessie bought a pound of sugar and gave the storekeeper 10 cents. He gave her 4 cents change; how much did he charge for the sugar?

4. There are 4 collars left in a box that had contained a dozen; how many were taken out?

5. 14 persons came into the dining room for dinner; there is room for only 9; how many must wait?

6. Frank has 6 cents left out of 14 cents that his father gave him; he spent the rest for a tablet; how much did it cost?

7. Chester had 13 marbles, but he lost all but 4; how many did he lose?

8. How many shad did a man sell, if he had a dozen and sold all but 3?

9. Last spring I planted 12 shade trees; they all died but 4; how many died?

10. A boy had 11 pigeons and sold all but 4; how many did he sell?

11. Frank had a dozen plums; he kept 4 for his sister and ate the others; how many did he eat?

12. I have 5 cents yet to get in order to have 14 cents; how much money have I?

39. Oral Exercise.

1. 6 pupils are absent from a class and 9 are present ; how many belong to this class ?
2. A man was sent to prison 5 years ago and he has yet 7 years to serve ; how many years must he serve in all ?
3. There were 12 knives on a table, but only 9 forks ; how many more knives than forks were there ?
4. A farmer had 8 sheep left after selling 7 ; how many had he at first ?
5. There were 16 tramps in a workhouse, but 7 of them were set free ; how many were held ?
6. How many girls were in a class at first, if 7 remained after 6 were promoted ?
7. How many cents must I put in my money bank to have 14 cents in it, if it already contains 9 cents ?
8. I have put 4 cans of corn into a box that will hold a dozen cans ; how many more will it hold ?
9. There are 14 sheep and lambs in a field ; how many of them are lambs, if there are 6 sheep ?
10. How many men must my father hire to have 14, if he already has 7 ?
11. After a fire had burned 8 stores in a block, there were 9 left ; how many were there before the fire ?
12. A girl bought a pound of sugar for 6 cents and received 4 cents change ; how much money did she give the grocer ?

Forming, Writing, and Reading Numbers from 20 to 100; Addition and Subtraction.

40. Two tens make *twenty*, written 20.



Twenty

Two tens and one make *twenty-one*, written 21.



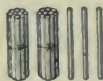
Twenty-one

Two tens and two make *twenty-two*, written 22.



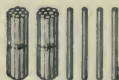
Twenty-two

Two tens and three make *twenty-three*, written 23.



Twenty-three

Twenty and four make *twenty-four*, written 24.



Twenty-four

Twenty and five make *twenty-five*, written 25.



Twenty-five

Twenty and six make *twenty-six*, written 26.



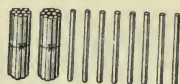
Twenty-six

Twenty and seven make *twenty-seven*, written 27.



Twenty-seven

Twenty and eight make *twenty-eight*,
written 28.



Twenty-eight

Twenty and nine make *twenty-nine*,
written 29.



Twenty-nine

41. Oral Exercise.

Beginning at 1, count to 29.

Read these numbers : 20, 21, 22, 23, 24, 25, 26, 27, 28, 29.

Tell the number of tens and ones in each of the above numbers.

How many ones are there in 2 tens and 4 ? 2 tens and 6 ?

42. Three tens make *thirty*, written 30.

Three Tens



Thirty

Three tens and one make *thirty-one*, written 31.



Thirty-one

43. Oral Exercise.

Three tens and two make what number ?

Three tens and three make what number ?

Three tens and four make what number ?

Three tens and five make what number ?

Three tens and six make what number ?

Three tens and seven make what number ?

Three tens and eight make what number ?

Three tens and nine make what number ?

30 WHOLE NUMBERS AND FRACTIONAL PARTS.

Beginning at 30, count to 39.

Read these numbers : 30, 31, 32, 33, 34, 35, 36, 37, 38, 39.

Tell the number of tens and ones in each of the above numbers.

How many ones are there in 3 tens and 1 ? 3 tens and 6 ?

44. Four tens make *forty*, written 40.



45. Oral Exercise.

Four tens and one make what number ?

Beginning at forty, name the numbers that are formed by forty and one ; forty and two ; forty and three ; forty and four ; forty and five ; forty and six ; forty and seven ; forty and eight ; forty and nine.

Read : 40, 41, 42, 43, 44, 45, 46, 47, 48, 49.

Beginning at forty, count to forty-nine.

46. Five tens make *fifty*, written 50.



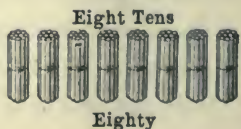
Six tens make *sixty*, written 60.



Seven tens make *seventy*, written 70.



Eight tens make *eighty*, written 80.



Nine tens make *ninety*, written 90.



Ten tens combined make *one hundred*, written 100.



47. Oral Exercise.

1. Name the numbers from fifty to sixty.
2. Name the numbers from sixty to seventy.
3. Name the numbers from seventy to eighty.
4. Name the numbers from eighty to ninety.
5. Name the numbers from ninety to one hundred.
6. Read : 50, 51, 52, 53, 54, 55, 56, 57, 58, 59.
7. Read : 60, 61, 62, 63, 64, 65, 66, 67, 68, 69..
8. Read : 70, 71, 72, 73, 74, 75, 76, 77, 78, 79.
9. Read : 80, 81, 82, 83, 84, 85, 86, 87, 88, 89.
10. Read : 90, 91, 92, 93, 94, 95, 96, 97, 98, 99.

48. Exercise.

Write in figures the numbers :

- | | |
|---------------------------|---------------------------------|
| 1. From one to ten. | 6. From fifty to sixty. |
| 2. From ten to twenty. | 7. From sixty to seventy. |
| 3. From twenty to thirty. | 8. From seventy to eighty. |
| 4. From thirty to forty. | 9. From eighty to ninety. |
| 5. From forty to fifty. | 10. From ninety to one hundred. |

49. Oral Exercise.

Read :

1. 22	5. 32	9. 51	13. 44	17. 72	21. 91
2. 25	6. 34	10. 57	14. 46	18. 70	22. 19
3. 28	7. 36	11. 20	15. 64	19. 15	23. 92
4. 30	8. 39	12. 33	16. 69	20. 88	24. 87

50. Oral Exercise.

1. Count from 10 to 20.
2. Count backwards from 20 to 10.
3. Count from 20 to 30.
4. Count backwards from 30 to 20.
5. Count from 30 to 40.
6. Count backwards from 50 to 40.
7. Count from 50 to 60.
8. Count backwards from 70 to 60.
9. Count from 70 to 80.
10. Count backwards from 90 to 80.

51. In numbers of two figures, the right-hand figure is called the **Units'** figure, and the left-hand figure the **Tens'** figure.

52. Oral Exercise.

1. In 87 name the tens' figure ; the units' figure.
2. In 63 how many tens are there, and how many units ?
3. In 90 how many tens are there, and how many units ?
4. How many figures are needed to write a number made up of 3 tens and 2 units ?

5. Name the number made up of 6 tens and 2 units.
6. What is the largest number that can be written with one figure? With two figures?
7. What two numbers can be written with the figures 8 and 9?

To the teacher. Teach Roman notation to C. See p. 79.

53. Oral Exercise.

1. Add each of the numbers 2, 5, 3, 6, 4, 7, 9, 8, 10 to

10 20 30 40 50 60 70 80 90

Name results only. Thus, 12, 15, 13, and so on; then 22, 25, 23, and so on; etc.

2. Add each of the numbers 2, 5, 3, 6, 4, 8, 7 to

11 21 31 41 51 61 71 81 91

3. Add each of the numbers 2, 5, 3, 6, 4, 7 to

12 22 32 42 52 62 72 82 92

4. Add each of the numbers 2, 5, 3, 6, 4 to

13 23 33 43 53 63 73 83 93

5. Add each of the numbers 2, 5, 4, 3 to

14 24 34 44 54 64 74 84 94

6. Add each of the numbers 2, 4, 3 to

15 25 35 45 55 65 75 85 95

7. Add each of the numbers 3 and 2 to

16 26 36 46 56 66 76 86 96

8. Add 2 to

17 27 37 47 57 67 77 87 97

54. Oral Exercise.

NOTE. The sign ? denotes *how many?*

1. $7 + 3 + 4 - 5 = ?$ Answer thus : 7, 10, 14, 9.

2. $3 + 4 + 2 = ?$

7. $5 + 4 + 6 + 3 = ?$

3. $7 + 5 + 6 = ?$

8. $7 + 4 + 3 - 5 = ?$

4. $2 + 5 - 1 = ?$

9. $9 - 4 + 6 - 7 = ?$

5. $14 - 9 + 7 = ?$

10. $14 - 9 + 8 - 6 = ?$

6. $18 - 9 - 4 = ?$

11. $18 - 9 - 3 - 4 = ?$

55. Exercise.

1. I bought a tablet for 4 cents, a pencil for 5 cents, and a sponge for 6 cents ; how much did I pay for all ?

2. There are 4 chairs at each side of a table and 1 at each end ; how many are there in all ?

3. A bicycle, a cart, and a wagon have, in all, how many wheels ?

4. From a box of 1 dozen collars I sold 6 to one man and 3 to another ; how many remain ?

5. A man owed 12 dollars. He paid 4 dollars at one time and 3 dollars at another ; how much does he still owe ?

6. A boy added three numbers, and the answer was 10. If two of the numbers were 3 and 5, what was the third ?

7. 2 sheep, 4 cows, 2 horses, and 2 mules make how many head of stock ?

8. A laborer had 5 dollars left of his month's wages after paying 4 dollars house rent and 9 dollars store bill ; what were his wages ?

9. Out of a dozen eggs mother used 2 for breakfast, 4 for dinner, and 4 for supper ; how many were left ?

10. 6 women, 5 girls, 3 men, and 2 boys are how many persons ?

11. I have 4 brothers and 3 sisters ; how many children are there in our family ?

12. Mother sent me to the store for a 5-cent spool of thread, a 4-cent loaf of bread, and a 2-cent box of matches. How much change should I bring back to her out of a dime and a 5-cent piece ?

56. Oral Exercise.

1. Add each of the numbers 2, 5, 3, 6, 4, 8, 7, 9 to

19 29 39 49 59 69 79 89

Name results only. Thus, 21, 24, 22, and so on ; then 31, 34, 32, and so on ; etc.

2. Add each of the numbers 2, 5, 3, 6, 4, 8, 7, 9 to

18 38 58 28 48 68 88 78

3. Add each of the numbers 5, 3, 6, 4, 8, 7, 9 to

17 37 57 27 47 67 87 77

4. Add each of the numbers 5, 8, 6, 9, 7, 4 to

16 36 56 26 46 66 86 76

5. Add each of the numbers 5, 8, 6, 7, 9 to

15 35 55 25 45 65 85 75

6. Add each of the numbers 6, 8, 7, 9 to

14 34 54 24 44 64 84 74

7. Add each of the numbers 8, 7, 9 to

13 33 53 23 43 63 83 73

8. Add each of the numbers 8 and 9 to

12 32 52 22 42 62 82 72

9. Add 9 to

11 31 51 21 41 61 81 71

Forming, Writing, and Reading Numbers from 100 to 1000; Addition and Subtraction.

57. Two hundred is written 200 ; three hundred, 300 ; nine hundred, 900.

58. One hundred and one make *one hundred one*, written 101.

One hundred and two make *one hundred two*, written 102.

One hundred and ten make *one hundred ten*, written 110.

Two hundred and forty make *two hundred forty*, written 240.

Six hundred and seventy-two make *six hundred seventy-two*, written 672.

Nine hundred and ninety-nine make *nine hundred ninety-nine*, written 999.

59. In numbers of three figures the first from the right is called the **Units'** figure, the second the **Tens'** figure, and the third the **Hundreds'** figure.

60. Exercise.

Write in figures :

1. Four hundred ; seven hundred.
2. Five hundred ; eight hundred.
3. Six hundred ; nine hundred.
4. One hundred three ; one hundred eleven.
5. Two hundred twenty ; three hundred ninety-nine.
6. Four hundred four ; five hundred sixty-eight.

7. Six hundred sixteen ; seven hundred seventy-seven.

8. Nine hundred ninety-nine ; four hundred forty-four,

61. Oral Exercise.

Read :

1. 103.	8. 213.	15. 900.	22. 527.	29. 149.
2. 112.	9. 400.	16. 901.	23. 752.	30. 222.
3. 126.	10. 407.	17. 910.	24. 257.	31. 806.
4. 129.	11. 510.	18. 888.	25. 600.	32. 419.
5. 131.	12. 111.	19. 808.	26. 999.	33. 344.
6. 209.	13. 222.	20. 919.	27. 909.	34. 707.
7. 211.	14. 876.	21. 764.	28. 526.	35. 818.

62. Oral Exercise.

- | | |
|---------------------------|--|
| 1. Count from 100 to 110. | 5. Count backwards from
210 to 200. |
| 2. Count from 330 to 340. | 6. Count backwards from
370 to 360. |
| 3. Count from 489 to 500. | 7. Count backwards from
910 to 890. |
| 4. Count from 789 to 911. | 8. Count backwards from
701 to 689. |

63. Oral Exercise.

1. In 765 how many units ? how many tens ? how many hundreds ?
2. In 860 how many units ? how many tens ? how many hundreds ?
3. In 409 how many units ? how many tens ? how many hundreds ?

38 WHOLE NUMBERS AND FRACTIONAL PARTS.

4. How many figures are needed to write a number made up of 3 hundreds, 2 tens, and 5 units ?
5. How many figures are needed to write a number made up of 4 hundreds and 2 tens ?
6. How many figures are needed to write a number made up of 2 hundreds and 3 units ?
7. Name the number made up of 2 hundreds and 2 tens.
8. What is the largest number that can be written with three figures ? What is the smallest ?

To the teacher.—Teach Roman notation to M. See p. 79.

64. The process of taking two or more numbers together is **Addition**.

65. The answer in addition is called the **Sum**.

66. Add 427 and 532.

427	2 units and 7 units are 9 units.
532	3 tens and 2 tens are 5 tens.
<u>532</u>	5 hundreds and 4 hundreds are 9 hundreds.
Sum 959	The sum is 959.

In practice, say 2 and 7 are 9 ; 3 and 2 are 5 ; 5 and 4 are 9.

67. Exercise.

Copy and add :

$$\begin{array}{r} 1. \ 28 \\ \ 31 \\ \hline \end{array}$$

$$\begin{array}{r} 3. \ 43 \\ \ 36 \\ \hline \end{array}$$

$$\begin{array}{r} 5. \ 56 \\ \ 32 \\ \hline \end{array}$$

$$\begin{array}{r} 7. \ 25 \\ \ 43 \\ \hline 21 \\ \hline \end{array}$$

$$\begin{array}{r} 2. \ 52 \\ \ 27 \\ \hline \end{array}$$

$$\begin{array}{r} 4. \ 65 \\ \ 34 \\ \hline \end{array}$$

$$\begin{array}{r} 6. \ 43 \\ \ 16 \\ \hline \end{array}$$

$$\begin{array}{r} 8. \ 16 \\ \ 52 \\ \hline 31 \\ \hline \end{array}$$

$$\begin{array}{r} 9. \ 80 \\ 11 \\ \hline 7 \\ \hline \end{array}$$

$$\begin{array}{r} 13. \ 235 \\ \hline 723 \\ \hline \end{array}$$

$$\begin{array}{r} 17. \ 222 \\ \hline 333 \\ \hline \end{array}$$

$$\begin{array}{r} 21. \ 222 \\ \hline 333 \\ \hline 444 \\ \hline \end{array}$$

$$\begin{array}{r} 10. \ 53 \\ 23 \\ \hline 12 \\ \hline \end{array}$$

$$\begin{array}{r} 14. \ 327 \\ \hline 652 \\ \hline \end{array}$$

$$\begin{array}{r} 18. \ 423 \\ \hline 322 \\ \hline \end{array}$$

$$\begin{array}{r} 22. \ 708 \\ \hline 260 \\ \hline 31 \\ \hline \end{array}$$

$$\begin{array}{r} 11. \ 42 \\ 35 \\ \hline 22 \\ \hline \end{array}$$

$$\begin{array}{r} 15. \ 326 \\ \hline 362 \\ \hline \end{array}$$

$$\begin{array}{r} 19. \ 321 \\ \hline 432 \\ \hline 146 \\ \hline \end{array}$$

$$\begin{array}{r} 23. \ 421 \\ \hline 243 \\ \hline 324 \\ \hline \end{array}$$

$$\begin{array}{r} 12. \ 14 \\ 32 \\ \hline 23 \\ \hline \end{array}$$

$$\begin{array}{r} 16. \ 342 \\ \hline 635 \\ \hline \end{array}$$

$$\begin{array}{r} 20. \ 321 \\ \hline 372 \\ \hline 305 \\ \hline \end{array}$$

$$\begin{array}{r} 24. \ 423 \\ \hline 332 \\ \hline 143 \\ \hline \end{array}$$

68. The process of taking one number from another is Subtraction.

69. The answer in subtraction is called the Difference.

70. Subtract 252 from 594.

Minuend	594	2 units from 4 units leaves 2 units.
Subtrahend	252	5 tens from 9 tens leaves 4 tens.
Difference	<u>342</u>	2 hundreds from 5 hundreds leaves 3 hundreds.
		The difference is 342.

In practice, say 2 from 4 leaves 2; 5 from 9 leaves 4; 2 from 5 leaves 3.

71. Exercise.

Copy and subtract :

$$\begin{array}{r} 1. \ 57 \\ \underline{23} \end{array}$$

$$\begin{array}{r} 7. \ 38 \\ \underline{17} \end{array}$$

$$\begin{array}{r} 13. \ 456 \\ \underline{234} \end{array}$$

$$\begin{array}{r} 19. \ 704 \\ \underline{203} \end{array}$$

$$\begin{array}{r} 2. \ 86 \\ \underline{52} \end{array}$$

$$\begin{array}{r} 8. \ 26 \\ \underline{4} \end{array}$$

$$\begin{array}{r} 14. \ 397 \\ \underline{175} \end{array}$$

$$\begin{array}{r} 20. \ 420 \\ \underline{310} \end{array}$$

$$\begin{array}{r} 3. \ 65 \\ \underline{32} \end{array}$$

$$\begin{array}{r} 9. \ 48 \\ \underline{33} \end{array}$$

$$\begin{array}{r} 15. \ 658 \\ \underline{423} \end{array}$$

$$\begin{array}{r} 21. \ 517 \\ \underline{306} \end{array}$$

$$\begin{array}{r} 4. \ 79 \\ \underline{45} \end{array}$$

$$\begin{array}{r} 10. \ 99 \\ \underline{66} \end{array}$$

$$\begin{array}{r} 16. \ 965 \\ \underline{532} \end{array}$$

$$\begin{array}{r} 22. \ 427 \\ \underline{120} \end{array}$$

$$\begin{array}{r} 5. \ 59 \\ \underline{16} \end{array}$$

$$\begin{array}{r} 11. \ 87 \\ \underline{75} \end{array}$$

$$\begin{array}{r} 17. \ 878 \\ \underline{532} \end{array}$$

$$\begin{array}{r} 23. \ 575 \\ \underline{475} \end{array}$$

$$\begin{array}{r} 6. \ 97 \\ \underline{5} \end{array}$$

$$\begin{array}{r} 12. \ 74 \\ \underline{33} \end{array}$$

$$\begin{array}{r} 18. \ 757 \\ \underline{243} \end{array}$$

$$\begin{array}{r} 24. \ 379 \\ \underline{375} \end{array}$$

72. Add 76 and 38.

8 units and 6 units are 14 units, or 1 ten and 4 units.

76 Write 4 in units' place and add 1 to the tens. 1 ten,

38 3 tens, and 7 tens are 11 tens, or 1 hundred and 1

114 ten. Write 1 in tens' place and 1 in hundreds' place.

The sum is 114.

*In practice, say 8 and 6 are 14; 1, 3 and 7 are 11.***73. Exercise.**

Copy and add :

$$\begin{array}{r} 1. \ 43 \\ \underline{48} \end{array}$$

$$\begin{array}{r} 2. \ 53 \\ \underline{27} \end{array}$$

$$\begin{array}{r} 3. \ 78 \\ \underline{51} \end{array}$$

$$\begin{array}{r} 4. \ 73 \\ \underline{36} \end{array}$$

5. 48 <u>85</u>	13. 89 <u>97</u>	21. 82 20 <u>19</u>	29. 93 27 34 <u>55</u>
6. 79 <u>66</u>	14. 98 <u>43</u>	22. 58 67 <u>38</u>	30. 75 89 32 <u>56</u>
7. 37 <u>87</u>	15. 39 <u>92</u>	23. 27 96 <u>14</u>	31. 185 <u>237</u>
8. 54 <u>98</u>	16. 37 <u>99</u>	24. 89 9 <u>17</u>	32. 476 <u>238</u>
9. 76 <u>59</u>	17. 54 <u>77</u>	25. 37 29 41 <u>23</u>	33. 567 <u>196</u>
10. 27 <u>98</u>	18. 87 <u>16</u>	26. 17 29 51 <u>93</u>	34. 438 <u>299</u>
11. 89 <u>7</u>	19. 48 37 <u>55</u>	27. 99 9 83 <u>20</u>	35. 347 <u>468</u>
12. 58 <u>80</u>	20. 98 32 <u>29</u>	28. 54 35 27 <u>58</u>	36. 298 <u>386</u>

42 WHOLE NUMBERS AND FRACTIONAL PARTS.

$$\begin{array}{r} 37. \ 275 \\ \underline{378} \end{array}$$

$$\begin{array}{r} 40. \ 74 \\ \underline{186} \end{array}$$

$$\begin{array}{r} 43. \ 127 \\ 346 \\ \underline{428} \end{array}$$

$$\begin{array}{r} 46. \ 175 \\ 319 \\ \underline{416} \end{array}$$

$$\begin{array}{r} 38. \ 654 \\ \underline{196} \end{array}$$

$$\begin{array}{r} 41. \ 237 \\ \underline{179} \end{array}$$

$$\begin{array}{r} 44. \ 486 \\ 201 \\ \underline{302} \end{array}$$

$$\begin{array}{r} 47. \ 209 \\ 127 \\ \underline{348} \end{array}$$

$$\begin{array}{r} 39. \ 289 \\ \underline{69} \end{array}$$

$$\begin{array}{r} 42. \ 37 \\ \underline{864} \end{array}$$

$$\begin{array}{r} 45. \ 174 \\ 297 \\ \underline{488} \end{array}$$

$$\begin{array}{r} 48. \ 498 \\ 126 \\ \underline{299} \end{array}$$

74. Subtract 37 from 65.

7 units cannot be taken from 5 units. Take 1 ten from the 6 tens, leaving 5 tens. Add this 1 ten, or 10 units, to 5 units, making 15 units. 7 units from 15 units leaves 8 units. 3 tens from 5 tens leaves 2 tens.

The difference is 28.

In practice, say 7 from 15 leaves 8; 3 from 5 leaves 2.

75. Exercise.

Copy and subtract :

$$\begin{array}{r} 1. \ 37 \\ \underline{19} \end{array}$$

$$\begin{array}{r} 5. \ 56 \\ \underline{89} \end{array}$$

$$\begin{array}{r} 9. \ 70 \\ \underline{18} \end{array}$$

$$\begin{array}{r} 13. \ 27 \\ \underline{18} \end{array}$$

$$\begin{array}{r} 2. \ 42 \\ \underline{29} \end{array}$$

$$\begin{array}{r} 6. \ 74 \\ \underline{36} \end{array}$$

$$\begin{array}{r} 10. \ 62 \\ \underline{9} \end{array}$$

$$\begin{array}{r} 14. \ 43 \\ \underline{19} \end{array}$$

$$\begin{array}{r} 3. \ 45 \\ \underline{26} \end{array}$$

$$\begin{array}{r} 7. \ 40 \\ \underline{29} \end{array}$$

$$\begin{array}{r} 11. \ 53 \\ \underline{18} \end{array}$$

$$\begin{array}{r} 15. \ 67 \\ \underline{19} \end{array}$$

$$\begin{array}{r} 4. \ 81 \\ \underline{38} \end{array}$$

$$\begin{array}{r} 8. \ 91 \\ \underline{82} \end{array}$$

$$\begin{array}{r} 12. \ 61 \\ \underline{14} \end{array}$$

$$\begin{array}{r} 16. \ 46 \\ \underline{7} \end{array}$$

$$\begin{array}{r} 17. \ 52 \\ \underline{28} \end{array}$$

$$\begin{array}{r} 23. \ 34 \\ \underline{15} \end{array}$$

$$\begin{array}{r} 29. \ 70 \\ \underline{27} \end{array}$$

$$\begin{array}{r} 35. \ 436 \\ \underline{187} \end{array}$$

$$\begin{array}{r} 18. \ 70 \\ \underline{36} \end{array}$$

$$\begin{array}{r} 24. \ 90 \\ \underline{44} \end{array}$$

$$\begin{array}{r} 30. \ 52 \\ \underline{36} \end{array}$$

$$\begin{array}{r} 36. \ 491 \\ \underline{238} \end{array}$$

$$\begin{array}{r} 19. \ 32 \\ \underline{27} \end{array}$$

$$\begin{array}{r} 25. \ 21 \\ \underline{9} \end{array}$$

$$\begin{array}{r} 31. \ 186 \\ \underline{28} \end{array}$$

$$\begin{array}{r} 37. \ 572 \\ \underline{387} \end{array}$$

$$\begin{array}{r} 20. \ 50 \\ \underline{41} \end{array}$$

$$\begin{array}{r} 26. \ 41 \\ \underline{29} \end{array}$$

$$\begin{array}{r} 32. \ 192 \\ \underline{49} \end{array}$$

$$\begin{array}{r} 38. \ 500 \\ \underline{283} \end{array}$$

$$\begin{array}{r} 21. \ 93 \\ \underline{84} \end{array}$$

$$\begin{array}{r} 27. \ 56 \\ \underline{17} \end{array}$$

$$\begin{array}{r} 33. \ 228 \\ \underline{182} \end{array}$$

$$\begin{array}{r} 39. \ 406 \\ \underline{308} \end{array}$$

$$\begin{array}{r} 22. \ 77 \\ \underline{58} \end{array}$$

$$\begin{array}{r} 28. \ 92 \\ \underline{13} \end{array}$$

$$\begin{array}{r} 34. \ 374 \\ \underline{182} \end{array}$$

$$\begin{array}{r} 40. \ 702 \\ \underline{184} \end{array}$$

76. Exercise.

Find the missing numbers :

$$\begin{array}{l} 1. \ 8 + 9 + 6 = \cdot \\ 16 + 32 + 27 = \cdot \\ \underline{24 + 41 + 44 = \cdot} \\ \cdot + \cdot + \cdot = \cdot \end{array}$$

$$\begin{array}{l} 3. \ 2 + 3 + 4 = \cdot \\ 20 + 30 + 40 = \cdot \\ 200 + 300 + 400 = \cdot \\ \underline{2 + 3 + 4 = \cdot} \\ \cdot + \cdot + \cdot = \cdot \end{array}$$

4. Add down ; subtract across.

$$\begin{array}{l} 2. \ 11 + 27 + 38 = \cdot \\ 9 + 18 + 60 = \cdot \\ \underline{36 + 7 + 8 = \cdot} \\ \cdot + \cdot + \cdot = \cdot \end{array}$$

$$\begin{array}{l} 186 - 27 = \cdot \\ 220 - 185 = \cdot \\ \underline{407 - 209 = \cdot} \\ \cdot - \cdot = \cdot \end{array}$$

77. Exercise.

1. There are 30 days in June, 31 days in July, and 31 days in August. How many days are there in these 3 months ?

30	is	the	number	of	days	in	June.
31	"	"	"	"	"	"	July.
31	"	"	"	"	"	"	August.
<u> </u>							
?	"	"	"	"	"	"	the 3 months.

2. A drover sold in one day 36 cows, 42 hogs, and 21 sheep ; how many head of stock did he sell ?

3. A woman sold a dealer 28 pounds of poultry, 16 pounds of butter, and 36 pounds of lard ; how many pounds of produce did she sell ?

4. A laborer worked 26 days in January, 22 days in February, and 25 days in March ; how many days did he work during these months ?

5. I spent at a grocer's to-day 36 cents for coffee, 24 cents for sugar, and 78 cents for meat ; how much did I spend in all ?

NOTE. Ct. stands for cent or cents.

36	ct.	was	the	amount	spent	for	coffee.
24	ct.	"	"	"	"	"	sugar.
78	ct.	"	"	"	"	"	meat.
<u> </u>							
?		"	"	"	"	"	all.

6. A clerk had \$25 of his month's salary left after paying a \$20 store bill and \$16 for house rent ; what was his month's salary ?

7. After 28 yards were sold from a piece of bunting, there remained 32 yards ; how many yards were there in the piece at first ?

8. A farmer had 36 bushels of wheat and used 19 bushels of it for seed ; how many bushels had he left ?

36 is the number of bushels the farmer had.

19 " " " " " he used for seed.

 ? " " " " " " had left.

9. A girl invited 40 of her friends to a picnic, but 12 of them failed to come ; how many came ?

10. There are 88 houses on a certain street ; if 28 of them are on one side of the street, how many are on the other side ?

11. A huckster had 80 shad ; if he sold all of them but 18, how many did he sell ?

12. A field of 68 acres was divided into two parts ; if the first part has in it 49 acres, what is the size of the second part ?

68 acres is the size of the field divided.

49 " " " " " " first part.

 ? " " " " " " second part.

13. How much older is my father than I am, if his age is 70 years and mine 24 years ?

14. I sold 32 yards from a piece of cheese cloth containing 60 yards ; how much remained ?

15. A dealer bought 3 pieces of printed lawn containing 50 yards, 15 yards, and 36 yards ; how much did he buy in all ?

16. A flagpole 86 feet long had 27 feet broken from the top ; how long was the piece that was left standing ?

17. A contractor has employed 26 Italians, 14 Hungarians, and 22 Polanders ; how many laborers has he employed ?

18. A boy had 18 papers left after selling 24 morning papers and 21 evening papers ; how many had he to begin with ?

19. 52 girls were given a problem ; if 19 of them had the wrong answer, how many solved the problem correctly ?

20. A drover sold a horse for 95 dollars ; after he had paid a debt of 27 dollars out of this sum, how much had he left ?

21. A boy weighed 101 pounds and has since gained 19 pounds ; how much does he now weigh ?

22. There were 28 men, 76 women, 62 boys and 78 girls at a Sunday-school picnic ; how many persons were there ?

23. There are 68 apple trees in an orchard and 18 more pear trees than apple trees ; how many trees are there of both kinds ?

24. A man's wages are 42 dollars a month and his son's 18 dollars less ; how much do both earn in a month ?

25. A drover had 264 sheep and bought 187 more ; how many had he then ?

26. Find the sum of three hundred fifty, two hundred twenty-five, and one hundred eighty.

27. A has 275 dollars and B 189 dollars ; how much would each have if A were to give B 186 dollars ?

28. I owed C 278 dollars, but paid him 129 dollars ; how much do I still owe him ?

29. A miller had 736 bushels of wheat but sold 478 bushels of it, and later bought 127 bushels ; how many bushels had he then ?

30. Add six hundred eighty-nine and two hundred sixteen, and take four hundred four from the sum.

Multiplication, Division, and Mensuration.

78. Oral Exercise.

Count by 2's :

1. From 2 to 20 ; from 20 to 2.

Thus, 2, 4, 6, etc. ; then 20, 18, 16, etc.

2. From 1 to 21 ; from 21 to 1.

Count by 3's :

3. From 3 to 30 ; from 30 to 3.

4. From 1 to 31 ; from 31 to 1.

5. From 2 to 32 ; from 32 to 2.

79. Oral Exercise.

How many are 1 and 1 ?

1 and 1 are how many times 1 ?

How many are 2 times 1 ?

What are the two parts of 2 ?

$$\bullet + \bullet = \bullet \bullet$$

What are the two parts of 3 ?

$$\bullet \bullet + \bullet = \bullet \bullet \bullet$$

How many are 2 and 2 ?

2 and 2 are how many times 2 ? $\bullet \bullet + \bullet \bullet = \bullet \bullet \bullet \bullet$

How many are 2 times 2 ?

What are the two parts of 4 here shown ?

Are these parts alike ?

When the parts of a number are alike they are said to be equal.

What is one of the two equal parts of 2 ? $\bullet \bullet = \bullet + \bullet$

How many ones are there in 2 ?

What is one of the two equal parts of 4 ? $\bullet \bullet \bullet \bullet = \bullet \bullet + \bullet \bullet$

How many twos (2's) are there in 4 ?

How many are 2 times 3 ?

What is one of the two equal parts of 6 ?

$$\begin{array}{cc} \bullet & \bullet & \bullet \\ \bullet & \bullet & \bullet \end{array}$$

Each of the two equal parts of a number is called one half of it.

One half is written $\frac{1}{2}$.

What is one half of 6 ?

How many 3's are there in 6 ?

How many are 2 times 4 ?

$$\bullet \bullet \bullet \bullet$$

What is one half of 8 ?

$$\bullet \bullet \bullet \bullet$$

How many 4's are there in 8 ?

How many are 2 times 5 ?

$$\bullet \bullet \bullet \bullet \bullet$$

What is $\frac{1}{2}$ of 10 ?

$$\bullet \bullet \bullet \bullet \bullet$$

How many 5's are there in 10 ?

How many are 2 times 6 ?

• • • • •

What is $\frac{1}{2}$ of 12 ?

• • • • •

How many 6's are there in 12 ?

How many are 2 times 7 ?

• • • • •

What is $\frac{1}{2}$ of 14 ?

• • • • •

How many 7's are there in 14 ?

How many are 2 times 8 ?

• • • • •

What is $\frac{1}{2}$ of 16 ?

• • • • •

How many 8's are there in 16 ?

How many are 2 times 9 ?

• • • • •

What is $\frac{1}{2}$ of 18 ?

• • • • •

How many 9's are there in 18 ?

80. Oral Exercise.

How many are 3 times 1 ?

• + • + • = • • •

What is one of the three equal parts of 3 ?

Each of the three equal parts of a number is called one third of it.

One third is written $\frac{1}{3}$.

What is $\frac{1}{3}$ of 3 ?

How many 1's are there in 3 ?

How many are 3 times 2 ?

• •
• •
• •

What is $\frac{1}{3}$ of 6 ?

How many 2's are there in 6 ?

50 WHOLE NUMBERS AND FRACTIONAL PARTS.

How many are 3 times 3 ?



What is $\frac{1}{3}$ of 9 ?

How many 3's are there in 9 ?

How many are 3 times 4 ?



What is $\frac{1}{3}$ of 12 ?

How many 4's are there in 12 ?

How many are 3 times 5 ?



What is $\frac{1}{3}$ of 15 ?

How many 5's are there in 15 ?

How many are 3 times 6 ?



What is $\frac{1}{3}$ of 18 ?

How many 6's are there in 18 ?

How many are 3 times 7 ?



What is $\frac{1}{3}$ of 21 ?

How many 7's are there in 21 ?

How many are 3 times 8 ?



What is $\frac{1}{3}$ of 24 ?

How many 8's are there in 24 ?

How many are 3 times 9 ?



What is $\frac{1}{3}$ of 27 ?

How many 9's are there in 27 ?

81. The sign \times is read *times*.

82. Exercise.

Copy, supplying the missing numbers :

$1 + 1 = .$	$4 + 4 = .$	$7 + 7 = .$
$2 \times 1 = .$	$2 \times 4 = .$	$2 \times 7 = .$
$2 + 2 = .$	$5 + 5 = .$	$8 + 8 = .$
$2 \times 2 = .$	$2 \times 5 = .$	$2 \times 8 = .$
$3 + 3 = .$	$6 + 6 = .$	$9 + 9 = .$
$2 \times 3 = .$	$2 \times 6 = .$	$2 \times 9 = .$

83. Exercise.

Copy, supplying the missing numbers, and learn :

TABLE.

$2 \times 1 = .$	$2 \times 4 = .$	$2 \times 7 = .$
$2 \times 2 = .$	$2 \times 5 = .$	$2 \times 8 = .$
$2 \times 3 = .$	$2 \times 6 = .$	$2 \times 9 = .$

84. Exercise.

Copy, supplying the missing numbers :

$2 \times 1 + 1 = .$	$2 \times 4 + 4 = .$	$2 \times 7 + 7 = .$
$3 \times 1 = .$	$3 \times 4 = .$	$3 \times 7 = .$
$2 \times 2 + 2 = .$	$2 \times 5 + 5 = .$	$2 \times 8 + 8 = .$
$3 \times 2 = .$	$3 \times 5 = .$	$3 \times 8 = .$
$2 \times 3 + 3 = .$	$2 \times 6 + 6 = .$	$2 \times 9 + 9 = .$
$3 \times 3 = .$	$3 \times 6 = .$	$3 \times 9 = .$

85. Exercise.

Copy, supplying the missing numbers, and learn :

TABLE.

$3 \times 1 = .$	$3 \times 4 = .$	$3 \times 7 = .$
$3 \times 2 = .$	$3 \times 5 = .$	$3 \times 8 = .$
$3 \times 3 = .$	$3 \times 6 = .$	$3 \times 9 = .$

86. Exercise.

Copy, supplying the missing numbers :

1. $2 \times 2 = .$	19. $. \times 1 = 2$	37. $3 \times . = 9$
2. $3 \times 8 = .$	20. $2 \times . = 10$	38. $3 \times . = 27$
3. $2 \times 7 = .$	21. $3 \times 7 = .$	39. $. \times 4 = 12$
4. $3 \times 3 = .$	22. $. \times 1 = 3$	40. $. \times 2 = 4$
5. $2 \times . = 6$	23. $2 \times 1 = .$	41. $3 \times . = 3$
6. $2 \times . = 4$	24. $3 \times . = 21$	42. $. \times 6 = 18$
7. $. \times 9 = 27$	25. $2 \times 4 = .$	43. $2 \times . = 16$
8. $3 \times 5 = .$	26. $. \times 9 = 18$	44. $. \times 3 = 9$
9. $. \times 8 = 24$	27. $2 \times 3 = .$	45. $3 \times . = 15$
10. $. \times 2 = 4$	28. $2 \times 6 = .$	46. $. \times 7 = 21$
11. $3 \times 6 = .$	29. $. \times 5 = 10$	47. $. \times 5 = 15$
12. $2 \times . = 8$	30. $2 \times . = 14$	48. $3 \times 2 = .$
13. $2 \times 5 = .$	31. $3 \times . = 24$	49. $2 \times 9 = .$
14. $2 \times . = 2$	32. $2 \times 8 = .$	50. $3 \times . = 12$
15. $2 \times . = 18$	33. $3 \times 9 = .$	51. $. \times 7 = 14$
16. $2 \times . = 12$	34. $. \times 1 = 2$	52. $3 \times 1 = .$
17. $3 \times . = 6$	35. $. \times 6 = 12$	53. $3 \times . = 18$
18. $3 \times 4 = .$	36. $. \times 2 = 6$	54. $. \times 8 = 16$

87. Oral Exercise.

1. What do 2 postal cards cost ?
2. What do 2 two-cent stamps cost ?



1 pint.



1 quart.

There are two pints (pt.) in a quart (qt.).

3. How many pints are there in 2 quarts ?
4. How many pints are there in 3 quarts ?
5. What do 3 one-cent stamps cost ?
6. How many feet have 2 horses ?
7. How many horses are needed to make 2 six-horse teams ?
8. How many horseshoes will it take to shoe 3 horses all around ?

Measure a yard-stick with a foot-rule to find that :

There are three feet (ft.) in a yard (yd.).

9. How many feet are there in 2 yards ?
10. How much fare will two persons pay, if each pays 5 cents ?
11. How many days are there in two weeks ?
12. How many feet are there in 3 yards ?
13. How many days are there in 3 weeks ?



1 quart.



1 gallon.

There are four quarts in a gallon (gal.).

14. How many quarts are there in 2 gallons ?
15. How many trees are there in two rows, each containing 8 trees ?
16. How many quarts are there in 3 gallons ?
17. Three persons each pay 5 cents car fare ; how much do they all pay together ?
18. How many panes of glass are needed for 3 windows, if 8 panes are needed for each window ?
19. I can hold out 9 pounds in each hand ; what weight can I hold out with both hands ?
20. How many persons are there at 3 tables, if 6 persons are at each table ?
21. A grass-plot is enclosed by 3 rows of hedge, each 9 yards long ; how many yards of hedge are there in all ?

Find the cost of :

22. 2 tablets at 6 cents each.
23. 3 lemons at 3 cents each.

24. 3 pounds of sugar at 6 cents a pound.

25. 2 sheep at 4 dollars apiece.

88. Exercise.

Copy, writing in each case the proper figure in place of x :

- | | | |
|------------------------------|------------------------------|-------------------------------|
| 1. $\frac{1}{2}$ of 2 = x | 7. $\frac{1}{2}$ of 14 = x | 13. $\frac{1}{3}$ of 12 = x |
| 2. $\frac{1}{2}$ of 4 = x | 8. $\frac{1}{2}$ of 16 = x | 14. $\frac{1}{3}$ of 15 = x |
| 3. $\frac{1}{2}$ of 6 = x | 9. $\frac{1}{2}$ of 18 = x | 15. $\frac{1}{3}$ of 18 = x |
| 4. $\frac{1}{2}$ of 8 = x | 10. $\frac{1}{3}$ of 3 = x | 16. $\frac{1}{3}$ of 21 = x |
| 5. $\frac{1}{2}$ of 10 = x | 11. $\frac{1}{3}$ of 6 = x | 17. $\frac{1}{3}$ of 24 = x |
| 6. $\frac{1}{2}$ of 12 = x | 12. $\frac{1}{3}$ of 9 = x | 18. $\frac{1}{3}$ of 27 = x |

89. Oral Exercise.

Read Exercise 88, supplying the missing numbers.

90. Exercise.

Copy, supplying the missing numbers :

- | | | |
|------------------|--------------------|--------------------|
| 1. 2 = — ones. | 7. 9 = — threes. | 13. 15 = — fives. |
| 2. 4 = — twos. | 8. 12 = — fours. | 14. 27 = — nines. |
| 3. 3 = — ones. | 9. 12 = — sixes. | 15. 14 = — sevens. |
| 4. 6 = — threes. | 10. 8 = — fours. | 16. 18 = — sixes. |
| 5. 6 = — twos. | 11. 21 = — sevens. | 17. 16 = — eights. |
| 6. 10 = — fives. | 12. 18 = — nines. | 18. 24 = — eights. |

91. Oral Exercise.

Read Exercise 90, supplying the missing numbers.

92. Exercise.

1. $\frac{1}{2}$ of 8 pints are — pints, or — quarts.

2. $\frac{1}{3}$ of a dozen are how many ?

3. Divide 6 cents equally between 2 boys. What part

of the money does each receive ? How much does each receive ?

4. If 2 quarts of syrup cost 12 cents, 1 quart will cost $\frac{1}{2}$ of — cents, or — cents.

5. How much oil does a stove burn in 1 hour, if it burns 4 quarts in 2 hours ?

6. If I buy 3 pints of ice cream for 3 persons, how much will that allow for each person ?

7. When 6 quarts of milk fill 3 cans of the same size, how much does each can hold ?

8. 18 pails were tied in 2 bundles of the same size ; how many were put in a bundle ?

9. I wish to have 18 pounds of sugar put up in 3 packages of the same weight ; how much must be put in each package ?

10. 24 children are formed into 3 classes of the same size ; how many are there in a class ?

11. Make and answer a question about $\frac{1}{3}$ of 18 cents.

12. Mary spent 15 cents for 3 pounds of sugar. Ask a question about this, and give the answer.

13. A boy had 12 cents. He spent $\frac{1}{2}$ of it for fire-crackers and $\frac{1}{3}$ of it for ice cream ; how much did he spend for both ?

14. A girl who earns 9 dollars and spends $\frac{1}{3}$ of it for board has how much left ?

93. Exercise.

1. If one lemon costs 3 cents, for 6 cents — lemons can be bought.

2. How many 3-foot ropes can be cut from a rope 9 feet long ?

3. How many times can a gallon measure be filled from 12 quarts of milk ?

4. How many 4-horse teams can be formed from 8 horses ?

5. How many 8-foot ropes can be cut from a rope 16 feet long ?

6. How many packages of oatmeal, each containing 4 pounds, must I buy to have 12 pounds ?

7. 2 quarts of raspberries at 8 cents a quart, with 5 cents, will pay for — sacks of salt at 3 cents a sack.

8. Last week I worked 3 days and was paid 6 dollars ; how much was that a day ?

9. In 12 pints there are — quarts.

10. 15 cents will pay for — car rides at 5 cents each.

11. How many tables must be set for 24 persons, if 8 persons can be seated at a table ?

12. How many are there in half a dozen ?

13. How many are there in one third of a dozen ?

14. 2 pecks of potatoes at 8 cents a peck are worth — pounds of flour at 4 cents a pound.

15. If I paid 10 cents for pencils at 5 cents apiece, how many did I buy ?

94. Oral Exercise.

Count by 4's :

1. From 4 to 40.

4. From 2 to 42.

2. From 40 to 4.

5. From 3 to 43.

3. From 1 to 41.

6. From 43 to 3.

Count by 5's :

7. From 5 to 50.

10. From 2 to 52.

8. From 50 to 5.

11. From 3 to 53.

9. From 1 to 51.

12. From 4 to 54.

95. Exercise.

Copy, supplying the missing numbers :

$3 \times 1 + 1 = .$	$3 \times 4 + 4 = .$	$3 \times 7 + 7 = .$
$4 \times 1 = .$	$4 \times 4 = .$	$4 \times 7 = .$
$3 \times 2 + 2 = .$	$3 \times 5 + 5 = .$	$3 \times 8 + 8 = .$
$4 \times 2 = .$	$4 \times 5 = .$	$4 \times 8 = .$
$3 \times 3 + 3 = .$	$3 \times 6 + 6 = .$	$3 \times 9 + 9 = .$
$4 \times 3 = .$	$4 \times 6 = .$	$4 \times 9 = .$

96. Exercise.

Copy, supplying the missing numbers and learn :

TABLE.

$4 \times 1 = .$	$4 \times 4 = .$	$4 \times 7 = .$
$4 \times 2 = .$	$4 \times 5 = .$	$4 \times 8 = .$
$4 \times 3 = .$	$4 \times 6 = .$	$4 \times 9 = .$

97. Exercise.

Copy, supplying the missing numbers :

$4 \times 1 + 1 = .$	$4 \times 4 + 4 = .$	$4 \times 7 + 7 = .$
$5 \times 1 = .$	$5 \times 4 = .$	$5 \times 7 = .$
$4 \times 2 + 2 = .$	$4 \times 5 + 5 = .$	$4 \times 8 + 8 = .$
$5 \times 2 = .$	$6 \times 5 = .$	$5 \times 8 = .$
$4 \times 3 + 3 = .$	$4 \times 6 + 6 = .$	$4 \times 9 + 9 = .$
$5 \times 3 = .$	$5 \times 6 = .$	$5 \times 9 = .$

98. Exercise.

Copy, supplying the missing numbers and learn :

TABLE.

$5 \times 1 = \cdot$

$5 \times 4 = \cdot$

$5 \times 7 = \cdot$

$5 \times 2 = \cdot$

$5 \times 5 = \cdot$

$5 \times 8 = \cdot$

$5 \times 3 = \cdot$

$5 \times 6 = \cdot$

$5 \times 9 = \cdot$

99. Exercise.

Copy, supplying the missing numbers :

$1. 4 \times 1 = \cdot$

$19. 5 \times \cdot = 15$

$37. 4 \times \cdot = 8$

$2. 4 \times \cdot = 12$

$20. \cdot \times 5 = 25$

$38. \cdot \times 4 = 16$

$3. 4 \times 6 = \cdot$

$21. 4 \times 2 = \cdot$

$39. 5 \times 4 = \cdot$

$4. 4 \times \cdot = 32$

$22. \cdot \times 6 = 24$

$40. 5 \times 5 = \cdot$

$5. 5 \times \cdot = 20$

$23. 4 \times 5 = \cdot$

$41. \cdot \times 2 = 8$

$6. 4 \times 4 = \cdot$

$24. \cdot \times 1 = 5$

$42. 5 \times \cdot = 25$

$7. 5 \times \cdot = 35$

$25. \cdot \times 7 = 28$

$43. \cdot \times 5 = 20$

$8. 5 \times 7 = \cdot$

$26. 5 \times \cdot = 30$

$44. 4 \times 7 = \cdot$

$9. \cdot \times 2 = 10$

$27. 4 \times \cdot = 20$

$45. 4 \times \cdot = 36$

$10. 5 \times 3 = \cdot$

$28. \cdot \times 6 = 30$

$46. 4 \times 9 = \cdot$

$11. 4 \times \cdot = 4$

$29. 5 \times 9 = \cdot$

$47. \cdot \times 9 = 45$

$12. \cdot \times 9 = 36$

$30. \cdot \times 3 = 15$

$48. 5 \times \cdot = 45$

$13. \cdot \times 8 = 40$

$31. 4 \times 3 = \cdot$

$49. 5 \times 6 = \cdot$

$14. 4 \times \cdot = 28$

$32. 5 \times \cdot = 10$

$50. 4 \times \cdot = 16$

$15. \cdot \times 7 = 35$

$33. \cdot \times 1 = 4$

$51. \cdot \times 4 = 20$

$16. 4 \times 8 = \cdot$

$34. 5 \times \cdot = 5$

$52. 4 \times \cdot = 24$

$17. 5 \times \cdot = 40$

$35. 5 \times 8 = \cdot$

$53. 5 \times 2 = \cdot$

$18. 5 \times 1 = \cdot$

$36. \cdot \times 3 = 12$

$54. \cdot \times 8 = 32$

100. Exercise.

1. In one week there are — days, and in 4 weeks there are 4 times — days, or — days.

2. In one yard there are — feet, and in 5 yards there are 5 times — feet, or — feet.

3. In one gallon there are — quarts, and in 4 gallons there are 4 times — quarts, or — quarts.

4. In one quart there are — pints, and in 5 quarts there are 5 times — pints, or — pints.



1 quart.



1 peck.



1 bushel.

There are 8 quarts (qt.) in a peck (pk.).

There are 4 pecks in a bushel (bu.).

5. How many quarts are there in 4 pecks? in 3 pecks?

6. How many quarts are there in 2 pk.? in 5 pk.?

7. How many pecks are there in 4 bushels? in 5 bushels?

8. How many pecks are there in 2 bu.? in 3 bu.?

9. 4×2 and how many make a dozen?

10. A dime and how many cents will pay for 3 pounds of sugar at 6 cents a pound?

11. How much change should a lady receive who bought 3 pounds of soap at 4 cents a pound and gave the clerk a dime and a 5-cent piece?

Find the cost of :

12. 2 pencils at 5 cents each.
13. 4 pounds of sugar at 5 cents each.
14. 5 oranges at 2 cents each.
15. 4 eye shades at 8 cents each.
16. 4 yards of ribbon at 6 cents a yard.
17. 5 packs of firecrackers at 5 cents a pack.
18. 5 loaves of bread at 6 cents a loaf.
19. 4 quarts of milk at 7 cents a quart.
20. 5 papers of pins at 5 cents a paper.

101. Each of the four equal parts of a number is called one fourth ($\frac{1}{4}$) of it.

102. Each of the five equal parts of a number is called one fifth ($\frac{1}{5}$) of it.

103. Exercise.

Copy, writing in each case the proper figure in place of x :

- | | | |
|----------------------------|-----------------------------|-----------------------------|
| 1. $\frac{1}{4}$ of 4 = x | 7. $\frac{1}{4}$ of 28 = x | 13. $\frac{1}{5}$ of 20 = x |
| 2. $\frac{1}{4}$ of 8 = x | 8. $\frac{1}{4}$ of 32 = x | 14. $\frac{1}{5}$ of 25 = x |
| 3. $\frac{1}{4}$ of 12 = x | 9. $\frac{1}{4}$ of 36 = x | 15. $\frac{1}{5}$ of 30 = x |
| 4. $\frac{1}{4}$ of 16 = x | 10. $\frac{1}{5}$ of 5 = x | 16. $\frac{1}{5}$ of 35 = x |
| 5. $\frac{1}{4}$ of 20 = x | 11. $\frac{1}{5}$ of 10 = x | 17. $\frac{1}{5}$ of 40 = x |
| 6. $\frac{1}{4}$ of 24 = x | 12. $\frac{1}{5}$ of 15 = x | 18. $\frac{1}{5}$ of 45 = x |

104. Oral Exercise.

Read Exercise 103, supplying the missing numbers.

105. Exercise.

Copy, supplying the missing numbers :

- | | | |
|---------------------------|-----------------------------|-----------------------------|
| 1. $4 = \text{— ones.}$ | 7. $24 = \text{— sixes.}$ | 13. $30 = \text{— sixes.}$ |
| 2. $10 = \text{— twos.}$ | 8. $36 = \text{— nines.}$ | 14. $5 = \text{— ones.}$ |
| 3. $8 = \text{— twos.}$ | 9. $20 = \text{— fives.}$ | 15. $45 = \text{— nines.}$ |
| 4. $15 = \text{— fives.}$ | 10. $12 = \text{— threes.}$ | 16. $32 = \text{— eights.}$ |
| 5. $16 = \text{— fours.}$ | 11. $25 = \text{— fives.}$ | 17. $35 = \text{— sevens.}$ |
| 6. $20 = \text{— fours.}$ | 12. $28 = \text{— sevens.}$ | 18. $40 = \text{— eights.}$ |

106. Oral Exercise.

Read Exercise 105, supplying the missing numbers.

107. Exercise.

1. If I pay 20 dollars for 4 weeks' board, how much is that a week ?
2. I wish to cut 40 yards of carpet into 5 equal strips ; how long must I make each strip ?
3. 10 pigeons will make — pair of pigeons.
4. How many quart bottles can be filled from 8 pints ?
5. How many 5-cent boxes of indigo can be bought for 20 cents ?
6. A school of 24 boys was divided into 4 equal classes ; how many boys does each class contain ?
7. How many are 24 less 8 divided by 4 ?
8. How many times must I reach into a box containing eggs to count out 2 dozen, if I take out 6 each time ?
9. In 16 quarts there are — pecks.
10. How many pieces, each 3 feet long, can I cut from 15 feet of twine ?

11. A painter received 18 dollars for painting a barn ; if he worked 6 days, how much did he earn each day ?

12. How many 5-cent combs can be bought for 40 cents ?

13. How many gallon jugs can be filled with 20 quarts of vinegar ?

14. Allowing a pound of meat for 2 persons, how much meat should be bought for a dinner at which 10 persons are to be served ?

15. How many pounds of sugar at 4 cents a pound can be bought in exchange for 3 pounds of lard at 8 cents a pound ?

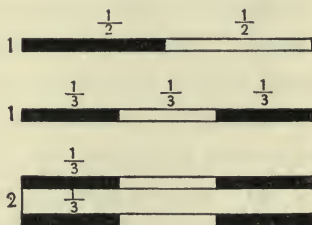
20 is called a score.

16. How many are there in $\frac{1}{4}$ of a dozen ? In $\frac{1}{4}$ of a score ?

108. One of the two equal parts of 1 is $\frac{1}{2}$; or $\frac{1}{2}$ of 1 is $\frac{1}{2}$.

One of the three equal parts of 1 is $\frac{1}{3}$; or $\frac{1}{3}$ of 1 is $\frac{1}{3}$.

$\frac{1}{3}$ of 2 is $\frac{1}{3}$ plus $\frac{1}{3}$, or $\frac{2}{3}$, read *two thirds*.



109. Find $\frac{1}{2}$ of 5.

Answer thus : $\frac{1}{2}$ of 5 is 2 and 1 over ; $\frac{1}{2}$ of 1 is $\frac{1}{2}$.

The answer is two and one half ; written $2\frac{1}{2}$.

110. Oral Exercise.

Find :

- | | | | |
|------------------------|-------------------------|-------------------------|-------------------------|
| 1. $\frac{1}{2}$ of 3. | 3. $\frac{1}{2}$ of 9. | 5. $\frac{1}{2}$ of 11. | 7. $\frac{1}{2}$ of 17. |
| 2. $\frac{1}{2}$ of 7. | 4. $\frac{1}{2}$ of 13. | 6. $\frac{1}{2}$ of 15. | 8. $\frac{1}{2}$ of 19. |

111. Find $\frac{1}{3}$ of 17.

Answer thus : $\frac{1}{3}$ of 17 is 5, and 2 over ; $\frac{1}{3}$ of 2 is $\frac{2}{3}$.

The answer is $5\frac{2}{3}$.

112. Oral Exercise.

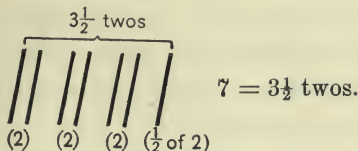
Find :

- | | | | |
|-------------------------|-------------------------|--------------------------|--------------------------|
| 1. $\frac{1}{3}$ of 5. | 5. $\frac{1}{3}$ of 4. | 9. $\frac{1}{3}$ of 10. | 13. $\frac{1}{3}$ of 13. |
| 2. $\frac{1}{3}$ of 8. | 6. $\frac{1}{3}$ of 7. | 10. $\frac{1}{3}$ of 22. | 14. $\frac{1}{3}$ of 25. |
| 3. $\frac{1}{3}$ of 11. | 7. $\frac{1}{3}$ of 16. | 11. $\frac{1}{3}$ of 23. | 15. $\frac{1}{3}$ of 26. |
| 4. $\frac{1}{3}$ of 14. | 8. $\frac{1}{3}$ of 19. | 12. $\frac{1}{3}$ of 28. | 16. $\frac{1}{3}$ of 29. |

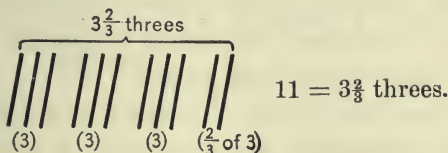
113. Exercise.

1. $\frac{1}{2}$ of 3 pints is — pints.
2. Find $\frac{1}{3}$ of 7 feet.
3. Divide 8 yards of ribbon equally among 3 girls.
4. If a man earned 3 dollars in 2 days, in 1 day he earned $\frac{1}{2}$ of — dollars, or — dollars.
5. A lady bought 3 quarts of plums for 25 cents ; how much were they a quart ?
6. At 7 cents a quart, what will a pint of milk cost ?
7. An iron rod 9 feet long was divided into 2 equal parts ; find the length of each part.
8. When 3 loaves of bread cost 10 cents, how much does one loaf cost ?
9. A family that uses a pound of tea in 3 weeks, uses how much per week ?
10. When 3 quarts of oysters fill 2 cans of equal size, how much does each can hold ?
11. How many days are there in half a week ?

114. How many 2's in 7 ?



How many 3's in 11 ?



115. Exercise.

Supply the missing numbers, using lines to illustrate :

- | | | |
|------------------|------------------|-------------------|
| 1. 5 = — twos. | 4. 7 = — threes. | 7. 11 = — twos. |
| 2. 4 = — threes. | 5. 3 = — twos. | 8. 10 = — threes. |
| 3. 9 = — twos. | 6. 8 = — threes. | 9. 14 = — threes. |

116. How many 2's in 7 ?

Answer thus: There are 3 *twos* in 7 and 1 over.

This 1 over is $\frac{1}{2}$ of another 2.

Therefore, the number of 2's in 7 is $3\frac{1}{2}$, read *three and one half*.

117. Oral Exercise.

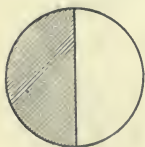
How many :

- | | | | |
|---------------|----------------|----------------|----------------|
| 1. 2's in 3 ? | 3. 2's in 13 ? | 5. 2's in 17 ? | 7. 2's in 19 ? |
| 2. 3's in 5 ? | 4. 3's in 20 ? | 6. 3's in 16 ? | 8. 3's in 25 ? |

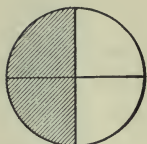
118. Exercise.

1. In 7 pints there are — quarts — pint.
2. In 11 feet there are — yards — feet.
3. How many 2-cent stamps can be bought for 15 cents, and what change will there be ?
4. 17 ducks will make how many pair, and leave how many over ?
5. A liveryman hired out 21 horses, 9 of them for driving singly and the others for double teams ; how many double teams were there ?
6. How many sheets of drawing paper at 3 cents each can be bought for 10 cents, and how much change will there be ?
7. If one yard of braid costs 2 cents, for 9 cents as many yards can be bought as — cents is contained times in — cents, or $4\frac{1}{2}$.
8. At 2 cents a pound, how many pounds of putty can be bought for 7 cents ?
9. A man who earns 2 dollars a day must work how many days to earn 11 dollars ?
10. How many bags of grain has a farmer, if he has 28 bushels in 3-bushel bags ?

119. Exercise.



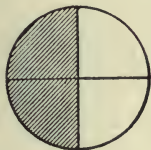
1. What is each of the two equal parts of 1 called ?
2. How many halves are there in 1 ?
3. Read : $\frac{1}{2}$; $\frac{2}{2}$.



4. What is each of the four equal parts of 1 called ?

5. What are two of the four equal parts of 1 called ?

6. Read : $\frac{1}{4}$; $\frac{2}{4}$; $\frac{3}{4}$; $\frac{4}{4}$.



$\frac{1}{4}$ of 2 = $\frac{1}{4} + \frac{1}{4}$, or $\frac{2}{4}$, or $\frac{1}{2}$.

7. Show that $\frac{1}{4}$ of 3 = $\frac{3}{4}$.

120. Find $\frac{1}{4}$ of 14.

Answer thus : $\frac{1}{4}$ of 14 is 3 and 2 over ; $\frac{1}{4}$ of 2 is $\frac{2}{4}$, or $\frac{1}{2}$.

The answer is $3\frac{1}{2}$.

121. Oral Exercise.


Find :

1. $\frac{1}{4}$ of 5. 4. $\frac{1}{4}$ of 9. 7. $\frac{1}{4}$ of 25. 10. $\frac{1}{4}$ of 31.

2. $\frac{1}{4}$ of 7. 5. $\frac{1}{4}$ of 11. 8. $\frac{1}{4}$ of 27. 11. $\frac{1}{4}$ of 33.

3. $\frac{1}{4}$ of 6. 6. $\frac{1}{4}$ of 10. 9. $\frac{1}{4}$ of 22. 12. $\frac{1}{4}$ of 34.

122. How many 4's are there in 14 ?





 $14 = 3\frac{1}{2}$ fours.

123. Exercise.

Supply the missing numbers, making drawings to illustrate :

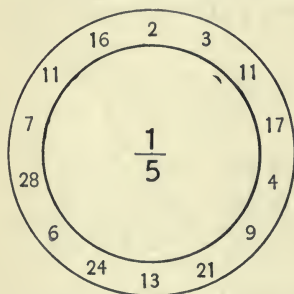
1. $9 = \text{— fours.}$ 4. $10 = \text{— fours.}$ 7. $15 = \text{— fours.}$

2. $7 = \text{— fours.}$ 5. $13 = \text{— fours.}$ 8. $23 = \text{— fours.}$

3. $6 = \text{— fours.}$ 6. $22 = \text{— fours.}$ 9. $25 = \text{— fours.}$

124. Exercise.

1. At 4 cents a yard, how many yards of lace can I buy for a dime, and what change will there be ?
2. In 19 quarts there are — gallons — quarts.
3. At 7 dollars a bushel, what is a peck of clover seed worth ?
4. When a gallon of oil costs 9 cents, how much is it a quart ?
5. What is each of the five equal parts of 1 called ?
6. Read : $\frac{1}{5}$; $\frac{2}{5}$; $\frac{3}{5}$; $\frac{4}{5}$; $\frac{5}{5}$.
7. Find $\frac{1}{5}$ of each number in the outer ring :



SUGGESTION. Solve as in § 120.

8. Show that there are $2\frac{2}{5}$ fives in 12.
9. 2 pounds of lard at 9 cents a pound will buy how many yards of lining at 4 cents a yard ?
10. A boy had 22 cents in 5-cent and one-cent pieces. He had 7 one-cent pieces ; how many 5-cent pieces had he ?
11. How many 5-cent packages of fire-crackers can a boy get for a pair of pigeons worth 28 cents ? How much money will he have left ?
12. A vessel that holds 9 quarts has in it 1 quart of

water ; how many gallons of water can still be poured into it ?

13. I have four pieces of money, together worth 12 cents. Two of them are one-cent pieces ; what are the other two ?

125. $3 \times 23 = 23 + 23 + 23 = 69$. The answer may be found by a shorter method by making use of the Table on p. 120, thus :

$\begin{array}{r} 23 \\ 3 \\ \hline 69 \end{array}$	$3 \times 23 = 3 \times (3 \text{ units} + 2 \text{ tens}).$ $3 \times 3 \text{ units} = 9 \text{ units, which we write in units' place.}$ $3 \times 2 \text{ tens} = 6 \text{ tens, which we write in tens' place.}$ The answer is 69.
---	--

In practice, say 3 times 3 are 9 ; 3 times 2 are 6.

126. The process of taking a number as many times as there are units in another number is called **Multiplication**. The answer in multiplication is called the **Product**.

127. Multiply 21 by 2.

Multiplicand	21
Multiplier	2
Product	$\begin{array}{r} 42 \end{array}$

128. Exercise.

Copy and multiply, and state which number is the multiplicand, which the multiplier, and which the product :

70 WHOLE NUMBERS AND FRACTIONAL PARTS.

1. 42 <u>2</u>	7. 30 <u>3</u>	13. 41 <u>5</u>	19. 201 <u>4</u>	25. 203 <u>3</u>
2. 33 <u>3</u>	8. 21 <u>3</u>	14. 120 <u>2</u>	20. 212 <u>4</u>	26. 121 <u>4</u>
3. 20 <u>2</u>	9. 21 <u>4</u>	15. 203 <u>2</u>	21. 200 <u>4</u>	27. 101 <u>5</u>
4. 40 <u>2</u>	10. 32 <u>4</u>	16. 101 <u>3</u>	22. 112 <u>4</u>	28. 323 <u>3</u>
5. 13 <u>3</u>	11. 40 <u>4</u>	17. 132 <u>3</u>	23. 102 <u>4</u>	29. 213 <u>3</u>
6. 32 <u>3</u>	12. 31 <u>5</u>	18. 332 <u>3</u>	24. 111 <u>5</u>	30. 222 <u>4</u>

129. One of the 3 equal parts of 39 may be found thus :

$$\begin{array}{r}
 3 \overline{) 39} \\
 \underline{13}
 \end{array}$$

$\frac{1}{3}$ of 39 = $\frac{1}{3}$ of (3 tens + 9 units).
 $\frac{1}{3}$ of 3 tens = 1 ten, which we write in tens' place.
 $\frac{1}{3}$ of 9 units = 3 units, which we write in units' place.
 The answer is 13.

In practice, say $\frac{1}{3}$ of 3 is 1 ; $\frac{1}{3}$ of 9 is 3.

130. Finding one of the equal parts of a number is called **Division**. The answer in division is called the **Quotient**.

131. The sign of division is \div , read *divided by*.

Thus, $24 \div 3$ is read *24 divided by 3*.

NOTE. $24 \div 3$ may also be expressed $3 \overline{) 24}$.

132. Divide 28 by 2.

$$\begin{array}{r} \text{Divisor} \quad 2 \overline{) 28} \text{ Dividend} \\ \text{Quotient} \quad 14 \end{array}$$

133. Exercise.

Copy and divide, and state which number is the dividend, which the divisor, and which the quotient:

- | | | | | |
|------------------------|-------------------------|--------------------------|--------------------------|--------------------------|
| 1. $2 \overline{) 42}$ | 7. $3 \overline{) 60}$ | 13. $4 \overline{) 80}$ | 19. $2 \overline{) 406}$ | 25. $4 \overline{) 444}$ |
| 2. $2 \overline{) 64}$ | 8. $3 \overline{) 33}$ | 14. $4 \overline{) 40}$ | 20. $3 \overline{) 333}$ | 26. $4 \overline{) 480}$ |
| 3. $2 \overline{) 86}$ | 9. $3 \overline{) 69}$ | 15. $5 \overline{) 50}$ | 21. $3 \overline{) 369}$ | 27. $4 \overline{) 408}$ |
| 4. $2 \overline{) 40}$ | 10. $4 \overline{) 84}$ | 16. $5 \overline{) 55}$ | 22. $3 \overline{) 960}$ | 28. $5 \overline{) 555}$ |
| 5. $3 \overline{) 36}$ | 11. $4 \overline{) 44}$ | 17. $2 \overline{) 222}$ | 23. $3 \overline{) 609}$ | 29. $5 \overline{) 505}$ |
| 6. $3 \overline{) 96}$ | 12. $4 \overline{) 48}$ | 18. $2 \overline{) 264}$ | 24. $3 \overline{) 306}$ | 30. $5 \overline{) 550}$ |

134. Multiply 45 by 4.

$$45 \quad 4 \times 45 = 4 \times (5 \text{ units} + 4 \text{ tens}).$$

$$\begin{array}{r} 4 \\ \hline 180 \end{array} \quad 4 \times 5 \text{ units} = 20 \text{ units, or 2 tens.}$$

Write 0 in units' place, and add 2 tens to the next product.

$4 \times 4 \text{ tens} = 16 \text{ tens}$, which added to the 2 tens makes 18 tens, or 1 hundred and 8 tens.

Write 8 in tens' place and 1 in hundreds' place.

The product is 180.

In practice, say 4 times 5 are 20 ; 4 times 4 are 16, and 2 are 18.

135. Exercise.

Copy and multiply :

1. 37	7. 34	13. 66	19. 46	25. 192
<u> 2 </u>	<u> 3 </u>	<u> 4 </u>	<u> 5 </u>	<u> 5 </u>

2. 39	8. 87	14. 89	20. 55	26. 287
<u> 2 </u>	<u> 3 </u>	<u> 4 </u>	<u> 5 </u>	<u> 3 </u>

3. 48	9. 64	15. 94	21. 136	27. 498
<u> 2 </u>	<u> 3 </u>	<u> 4 </u>	<u> 2 </u>	<u> 2 </u>

4. 56	10. 95	16. 19	22. 176	28. 185
<u> 2 </u>	<u> 3 </u>	<u> 5 </u>	<u> 3 </u>	<u> 5 </u>

5. 75	11. 23	17. 28	23. 135	29. 225
<u> 2 </u>	<u> 4 </u>	<u> 5 </u>	<u> 3 </u>	<u> 4 </u>

6. 29	12. 57	18. 37	24. 186	30. 199
<u> 3 </u>	<u> 4 </u>	<u> 5 </u>	<u> 4 </u>	<u> 4 </u>

136. Exercise.

1. How many pails are there in 4 bundles, if each bundle contains 52 pails ?

52 is the number of pails in 1 bundle.

 4

? is the number of pails in 4 bundles.

2. How many are there in 4 score ?

3. How many oranges are there in 3 boxes each containing 36 oranges ?

4. A bushel of oats weighs 32 pounds ; find the weight of 3 bushels of oats.

32 pounds is the weight of 1 bushel of oats.

3

? pounds is the weight of 3 bushels of oats.

5. A bushel of wheat weighs 60 pounds ; find the weight of 5 bushels of wheat.

6. How much will a clerk save in 4 months, if he saves \$26 a month ?

There are 24 hours (hr.) in one day (da.).

7. How many hours are there in 4 days ?

8. A barrel of flour weighs 196 pounds ; find the weight of 4 barrels of flour.

9. Find the cost of 3 pounds of butter at 23 cents a pound.

10. Find the cost of 4 pounds of ham at 16 cents a pound.

11. If there are 24 sheets of paper in a box, how many sheets are there in 4 boxes of the same size ?

12. Find the cost of 3 hundred shad at \$25 per hundred.

137. Divide 312 by 4.

4) 312 $\frac{1}{4}$ of 312 = $\frac{1}{4}$ of (31 tens + 2 units).

78 $\frac{1}{4}$ of 31 tens = 7 tens, and 3 tens over.

3 tens + 2 units = 32 units.

$\frac{1}{4}$ of 32 units = 8 units. The quotient is 78.

In practice, say $\frac{1}{4}$ of 31 is 7 and 3 over ; $\frac{1}{4}$ of 32 is 8.

138. Exercise.

Copy and divide :

- | | | | |
|------------------------|------------------------|-------------------------|-------------------------|
| 1. $2)\underline{34}$ | 12. $4)\underline{64}$ | 23. $7)\underline{91}$ | 34. $3)\underline{252}$ |
| 2. $2)\underline{76}$ | 13. $4)\underline{72}$ | 24. $8)\underline{96}$ | 35. $3)\underline{405}$ |
| 3. $2)\underline{92}$ | 14. $4)\underline{76}$ | 25. $7)\underline{98}$ | 36. $4)\underline{164}$ |
| 4. $2)\underline{58}$ | 15. $4)\underline{92}$ | 26. $2)\underline{124}$ | 37. $4)\underline{876}$ |
| 5. $2)\underline{98}$ | 16. $5)\underline{65}$ | 27. $2)\underline{136}$ | 38. $4)\underline{172}$ |
| 6. $3)\underline{42}$ | 17. $5)\underline{75}$ | 28. $2)\underline{154}$ | 39. $4)\underline{952}$ |
| 7. $3)\underline{48}$ | 18. $5)\underline{85}$ | 29. $2)\underline{306}$ | 40. $4)\underline{708}$ |
| 8. $3)\underline{54}$ | 19. $5)\underline{95}$ | 30. $2)\underline{178}$ | 41. $5)\underline{515}$ |
| 9. $3)\underline{72}$ | 20. $6)\underline{72}$ | 31. $3)\underline{153}$ | 42. $5)\underline{585}$ |
| 10. $3)\underline{84}$ | 21. $6)\underline{84}$ | 32. $3)\underline{657}$ | 43. $5)\underline{195}$ |
| 11. $4)\underline{56}$ | 22. $6)\underline{90}$ | 33. $3)\underline{174}$ | 44. $5)\underline{705}$ |

139. Exercise.

1. A dealer bought 4 dozen eggs for 84 cents ; how much was that a dozen ?

84 cents was the cost of 4 dozen.

$4)\underline{84}$ cents

? cents was the cost of 1 dozen.

2. How much was paid a week to a workman who received \$75 for 5 weeks' work ?

3. A piece of carpet measuring 72 yards was cut into 4 strips of equal length ; find the length of each strip.

4. 56 chairs are to be arranged in 4 rows with the same number in each row ; how many must be put in a row ?

56 is the number to be put in 4 rows.

4) 56

? is the number that must be put in a row.

5. 144 handkerchiefs were put up in 3 boxes, the same number being in each box ; how many were put in a box ?

6. 5 bushels of feed weighed 225 pounds ; what did each bushel weigh ?

7. A farmer sold 2 cows, the first for 35 dollars and the second for 43 dollars ; what was the average selling price ?

35 dollars was the selling price of the first.

43 " " " " " second.

78 " " " " " both.

2) 78 "

? was the average selling price.

8. A merchant bought 2 hams ; the first weighed 23 pounds and the second 25 pounds ; what was their average weight ?

140. Finding how many times 3 feet is contained in 12 feet is measuring 12 feet by 3 feet.

141. The process of measuring one number by another is **Mensuration**.

142. The sign of mensuration is $:$, read *measured by*.

Thus, $12 : 3$ is read *12 measured by 3*,

143. The number of 4's in 12 is 3; that is, $12 : 4 = 3$.

But $12 \div 4 = 3$.

Therefore, $12 : 4 = 12 \div 4$. Therefore,

To measure one number by another, divide the first by the second.

144. Oral Exercise.

Measure :

1. 12 by 4. Answer thus : $12 : 4 = 12 \div 4$, or 3.

2. 14 by 2. 6. 32 by 4. 10. 28 by 4. 14. 24 by 4.

3. 24 by 3. 7. 30 by 5. 11. 40 by 5. 15. 35 by 5.

4. 18 by 2. 8. 27 by 3. 12. 32 by 4. 16. 18 by 3.

5. 27 by 3. 9. 36 by 4. 13. 21 by 3. 17. 25 by 5.

145. 2 feet is contained in 14 feet as many times as 2 is contained in 14; that is,

$14 \text{ feet} : 2 \text{ feet} = 14 : 2$, or $14 \div 2$. Therefore,

To measure one amount by another, divide the number of units in the first by the number of units in the second.

146. Oral Exercise.

Measure :

1. 14 feet by 2 feet.

Answer thus : $14 \text{ feet} : 2 \text{ feet} = 14 \div 2 = 7$.

2. 16 cents by 2 cents.

7. 45 dollars by 5 dollars.

3. 24 yards by 3 yards.

8. 28 men by 4 men.

4. 20 quarts by 4 quarts.

9. 30 feet by 5 feet.

5. 25 days by 5 days.

10. 20 pounds by 4 pounds.

6. 36 quarts by 4 quarts.

11. 32 gallons by 4 gallons.

147. Exercise.

1. A man bought 144 colored crayons in boxes containing four pieces each ; how many boxes did he buy ?

144 was the number of pieces bought.

4 was the number of pieces in each box.

4) 144

? was the number of boxes bought.

2. How many 2-cent stamps can be bought for 60 cents ?

3. How many gallon jugs can be filled with 64 quarts of vinegar ?

4. How many 3-bushel bags are needed to hold 168 bushels of grain ?

5. How many horses can be shod all around with 264 horseshoes ?

6. How many bushels are there in 72 pecks ?

7. How many 5-cent pieces will make 75 cents ?

8. 144 dozen eggs are to be packed in crates, each holding 4 dozen ; how many crates are needed ?

9. At 5 cents a pound, how many pounds of sugar can be bought for 90 cents ?

10. How many yards long is a rope that is 426 feet long ?

11. If a family use 2 quarts of milk a day, in how many days will they have used 5 gallons of milk ?

12. In how many days will a boy save 60 cents, if he saves 5 cents a day ?

Forming, Writing, and Reading Numbers from
1000 to 10000.

148. Ten hundred make *one thousand*, written 1000.

Two thousand is written 2000; three thousand, 3000.

One thousand one is written 1001.

One thousand ten is written 1010.

Five thousand two hundred is written 5200.

Four thousand seven hundred twenty is written 4720.

Nine thousand nine hundred ninety-nine is written 9999.

149. Exercise.

Write in figures:

- | | |
|---|--------------------------------|
| 1. Three thousand. | 7. Seven thousand. |
| 2. Four thousand. | 8. Eight thousand. |
| 3. Five thousand. | 9. Nine thousand. |
| 4. Six thousand. | 10. One thousand two. |
| 5. Two thousand twenty. | 11. Six thousand five hundred. |
| 6. Four thousand forty. | 12. Nine thousand fifteen. |
| 13. Seven thousand six hundred eighty-four. | |
| 14. Nine thousand four hundred forty. | |
| 15. Eight thousand six hundred four. | |
| 16. Seven thousand eight hundred sixty-six. | |
| 17. Nine thousand eight hundred twenty. | |
| 18. Four thousand nine hundred ninety-nine. | |
| 19. One thousand one hundred one. | |

150. Exercise.

Read, and write in words :

- | | | | |
|----------|----------|-----------|-----------|
| 1. 4000. | 5. 1200. | 9. 1009. | 13. 8777. |
| 2. 7000. | 6. 5021. | 10. 9090. | 14. 6666. |
| 3. 7002. | 7. 9888. | 11. 5007. | 15. 2754. |
| 4. 1011. | 8. 7232. | 12. 8201. | 16. 3215. |

Roman Notation.

151. Capital letters are often used instead of figures in numbering chapters and sections of books, pages of prefaces and introductions, divisions on clock dials, etc.

This method of writing numbers is called the Roman System.

$$\begin{array}{cccccc} \text{I} = 1 & \text{V} = 5 & \text{X} = 10 & \text{L} = 50 & \text{C} = 100 \\ & \text{D} = 500 & \text{M} = 1000. & & \end{array}$$

NOTE. The number for which a letter stands is called the *value* of the letter.

152. *If a letter is repeated its value is repeated.*

Thus, II = 2 ; III = 3 ; XX = 20 ; CC = 200 ; MMM = 3000.

153. *If a letter is written before one of greater value, the difference of their values is expressed.*

Thus, IV = 4 ; IX = 9 ; XL = 40 ; XC = 90.

154. *If a letter or a combination of letters is written after a letter of greater value, the sum of the values is expressed.*

Thus, VI = 6 ; XIII = 13 ; LV = 55 ; LIX = 59.

155. *A dash placed over a letter or a combination of letters multiplies its value by 1000.*

Thus, $\overline{V} = 5000$; $\overline{VII} = 7000$; $\overline{IX} = 9000$.

156. Units, tens, hundreds, and thousands only are written according to the principles given above.

TABLE.

Units.	Tens.	Hundreds.	Thousands.
I = 1	X = 10	C = 100	M = 1000
II = 2	XX = 20	CC = 200	MM = 2000
III = 3	XXX = 30	CCC = 300	MMM = 3000
IV = 4	XL = 40	CD = 400	\overline{IV} = 4000
V = 5	L = 50	D = 500	\overline{V} = 5000
VI = 6	LX = 60	DC = 600	\overline{VI} = 6000
VII = 7	LXX = 70	DCC = 700	\overline{VII} = 7000
VIII = 8	LXXX = 80	DCCC = 800	\overline{VIII} = 8000
IX = 9	XC = 90	CM = 900	\overline{IX} = 9000

157. In writing numbers between those in the above table, hundreds are written after thousands, tens after hundreds, and units after tens.

Thus, 1567 is written MDLXVII ; 2053, MMLIII ; 4508, \overline{IV} DVIII ; 3600, MMMDC.

NOTE. IIII = 4 ; XXXX = 40 ; CCCC = 400, are also in use.

158. Exercise.

Write by the Roman method :

1. The nine simple numbers.
2. The nine tens.
3. The nine hundreds.
4. The first nine thousands.

The numbers between

5. 10 and 20.
6. 20 and 30.
7. 30 and 40.
8. 40 and 50.
9. 50 and 60.
10. 60 and 70.
11. 70 and 80.
12. 80 and 90.
13. 90 and 100.

The following numbers :

14. 101.	17. 140.	20. 400.	23. 1899.
15. 120.	18. 149.	21. 666.	24. 1906.
16. 150.	19. 194.	22. 924.	25. 1910.

Write in figures the following :

26. IX.	33. XCIX.	40. MCM.
27. XIV.	34. CLX.	41. MCMV.
28. XIX.	35. CLXII.	42. MCMIX.
29. XXXIV.	36. CCCLXV.	43. MCMXIX.
30. XXXVIII.	37. CDIX.	44. MDCCCXCIX.
31. XLIX.	38. CDLXIV.	45. <u>VII.</u>
32. LXIV.	39. DCCCV.	46. <u>VCCIV.</u>

United States Money.

159. In the money of the United States,

10 cents = 1 dime.

10 dimes = 1 dollar.

100 cents = 1 dollar.

160. The dollar sign is \$. It is placed before the number of dollars to be expressed.

Thus, 5 dollars is expressed \$5.

161. If a sum of money consists of dollars and cents, a point called the **Decimal Point** is written between the number of dollars and the number of cents. If the number of cents is less than ten, a

cipher is written between the decimal point and the number of cents.

Thus, *3 dollars 25 cents* is expressed \$3.25, and *4 dollars 8 cents* is expressed \$4.08.

162. The abbreviation for the word cent or cents is *ct.* or ϕ .

Thus, *25 cents* may be expressed *25 ct.* or *25 ϕ .*

163. A sum of money less than a dollar, such as 36 cents, may also be expressed \$0.36.

164. Oral Exercise.

Read :

- | | | | |
|------------|-------------|------------|----------------------------|
| 1. \$2. | 3. \$15.25. | 5. \$0.62. | 7. \$88.66. |
| 2. \$3.05. | 4. \$37.50. | 6. \$0.07. | 8. \$ 0.12 $\frac{1}{2}$. |

165. Exercise.

Write, using the dollar sign :

- | | |
|-------------------------|-----------------------|
| 1. 6 dollars. | 4. 7 dollars 5 cents. |
| 2. 75 dollars 25 cents. | 5. 87 cents. |
| 3. 11 dollars 15 cents. | 6. 9 cents. |

166. Exercise.

1. How many cents are there in \$3 ? \$5 ? \$12 ?
2. Change \$4.36 to cents.
\$4.36 = 436 ct.
3. How many cents are there in \$2.25 ? \$4.36 ? \$14.36 ?

4. Change to cents :
\$6.84 ; \$9.32 ; \$15.36 ; \$28.45.
5. Change 600 ct. to dollars.
600 ct. = \$6.00, or \$6.
6. Change to dollars :
500 ct. ; 900 ct. ; 1500 ct. ; 2800 ct.
7. Change 324 ct. to dollars and cents.
324 ct. = \$3.24.
8. Change to dollars and cents :
539 ct. ; 608 ct. ; 3125 ct. ; 6175 ct.

Making Change.

167. A man bought a fork for 63¢ and gave the storekeeper a dollar bill ; how will the storekeeper make the change, using as few pieces of money as possible ?

The storekeeper will give the man 2 cents, a dime, and a quarter-dollar. He may count out the change, saying, 63 ct., 65 ct., 75 ct., 1 dollar.

168. Oral Exercise.

Make the change in the following examples, using as few pieces of money in each case as possible ; and state how the change may be counted out :

Sales.	Money Paid.
1. 17¢.	Quarter-dollar.
2. 32¢.	Half-dollar.
3. 63¢.	Dollar.

- | | |
|--------------|---------------------------------|
| 4. 62¢. | Half-dollar and quarter-dollar. |
| 5. 12¢. | A dime and a 5-cent piece. |
| 6. 33¢. | A quarter dollar and a dime. |
| 7. \$1.15 | \$2-bill. |
| 8. \$2.12 | \$2-bill and a \$1-bill. |
| 9. \$3.28 | \$5-bill. |
| 10. 9¢. | \$2-bill. |
| 11. \$28.37. | \$20-bill and a \$10-bill. |

Addition and Subtraction.

169. Add :

3745 In practice we may say :

2634 3, 7, 12. Write 2 in units' place and add 1 to the
1853 tens.

8232 Then 1, 6, 9, 13. Write 3 in tens' place and add
1 to the hundreds.

Then 1, 9, 15, 22. Write 2 in the hundreds' place and add 2 to
the thousands.

Then 2, 3, 5, 8. Write 8 in the thousands' place.

The sum is 8232.

170. Exercise.

Copy and add :

- | | | | | |
|------------|------------|-------------|-------------|-------------|
| 1. 345 | 3. 378 | 5. 765 | 7. 5482 | 9. 3482 |
| <u>876</u> | <u>745</u> | <u>986</u> | <u>2708</u> | <u>2351</u> |
| 2. 421 | 4. 987 | 6. 2768 | 8. 5832 | 10. 7683 |
| <u>899</u> | <u>876</u> | <u>1289</u> | <u>3168</u> | <u>2297</u> |

11. 3275	13. 2845	15. 3754	17. 329	19. 328
876	738	2832	896	798
<u>49</u>	<u>897</u>	<u>1709</u>	539	654
			<u>854</u>	<u>29</u>

12. 832	14. 2597	16. 763	18. 327	20. 377
2375	3685	854	83	479
<u>1783</u>	<u>1763</u>	963	901	637
		<u>785</u>	<u>78</u>	<u>507</u>

Find the missing numbers by adding down and across :

21. 234 + 567 + 728 = .	23. 308 + 78 + 230 = .
109 + 106 + 34 = .	106 + 7 + 98 = .
<u>48 + 729 + 138 = .</u>	<u>99 + 126 + 3 = .</u>
. + . + . = .	. + . + . = .

22. 728 + 925 + 324 = .	24. 1024 + 276 + 325 = .
75 + 109 + 7 = .	106 + 72 + 78 = .
<u>768 + 325 + 785 = .</u>	<u>48 + 9 + 3 = .</u>
. + . + . = .	. + . + . = .

Find the missing numbers by multiplying across and adding down :

25. 3 × 228 = .	26. 4 × 164 = .	27. 5 × 75 = .
3 × 456 = .	4 × 108 = .	5 × 110 = .
3 × 325 = .	4 × 378 = .	5 × 306 = .
<u>3 × 184 = .</u>	<u>4 × 76 = .</u>	<u>5 × 9 = .</u>
3 × . = .	4 × . = .	5 × . = .

171. Subtract :

8214	In practice begin at units and subtract thus :
<u>1738</u>	8 from 14 leaves 6.
6476	3 from 10 leaves 7.
	7 from 11 leaves 4.

1 from 7 leaves 6. The difference is 6476.

172. Exercise.

Copy and subtract :

1. 832	6. 1000	11. 7001	16. 7200	21. 3020
<u>574</u>	<u>389</u>	<u>2098</u>	<u>99</u>	<u>1982</u>
2. 722	7. 1070	12. 3010	17. 3672	22. 7008
<u>448</u>	<u>179</u>	<u>2111</u>	<u>968</u>	<u>1999</u>
3. 320	8. 2080	13. 5002	18. 7202	23. 6320
<u>167</u>	<u>1979</u>	<u>4983</u>	<u>5193</u>	<u>2198</u>
4. 256	9. 3426	14. 5000	19. 8201	24. 3507
<u>148</u>	<u>2837</u>	<u>3092</u>	<u>7192</u>	<u>2198</u>
5. 706	10. 9000	15. 8030	20. 3380	25. 4320
<u>188</u>	<u>1807</u>	<u>1929</u>	<u>1099</u>	<u>1738</u>

173. Find the sum of \$13.25, \$10.48, and \$0.76.

\$13.25	Write the sums, placing dollars under dollars and
10.48	cents under cents. Add as in ordinary numbers,
<u>0.76</u>	and place the decimal point before the last two
\$24.49	figures to separate dollars from cents.

174. Exercise.

Find the sum :

1.	2.	3.	4.
\$ 3.25	\$ 8.48	\$12.38	\$24.06
5.63	7.35	15.09	33.45
7.42	0.67	32.26	8.37
<u>12.56</u>	<u>26.89</u>	<u>31.56</u>	<u>15.00</u>

5. $\$7.25 + \$6.48 + \$15.23 + \$28.16.$

6. $\$9.32 + \$17 + \$ 0.64 + \$36.99.$

7. $\$0.56 + \$1.38 + \$10.49 + \$ 0.18 + \$14.38.$

175. From \$27 take \$14.27.

\$27.00

14.27

\$12.73

Write dollars under dollars and cents under cents. Subtract as in ordinary numbers, and place the decimal point before the last two figures to separate dollars from cents.

176. Exercise.

Find the difference :

1. \$4.26	2. \$15.42	3. \$146.38	4. \$96.45
<u>3.83</u>	<u>9.83</u>	<u>27.94</u>	<u>0.87</u>

5. $\$34.10 - \19.46 7. $\$82.56 - 37.49$ 9. $\$10 - \$ 6.48$

6. $\$ 1.48 - \$ 0.79$ 8. $\$ 5 - 3.69$ 10. $\$50 - \42.65

177. Exercise.

1. A man bought a lot of land for \$350 and built on it a house that cost \$1875 ; how much did both cost him ?

2. James had \$2.75 and earned \$3.75 more ; how much had he then ?

3. In a certain town there are 3578 males and 4422 females ; how many people has the town ?

4. Take \$1.25 from \$5.00.

5. I had a 1000-mile ticket, but have used 695 miles of it ; how many miles may I yet ride on it ?

6. A farmer's crop for a certain year was 268 bushels of wheat, 308 bushels of oats, 564 bushels of corn, and 78 bushels of rye ; how much grain did he raise that year ?

7. Frank and John together have \$4.85. If Frank has \$2.90, how much has John ?

8. A wagon loaded with coal weighed 5268 pounds. If the wagon weighed 1825 pounds, what was the weight of the coal ?

9. A farmer bought a plow for \$8.75 and gave in payment a \$20-bill ; how much change should he receive ?

10. A farmer was paid \$175.20 for his wheat and \$106.30 for his potatoes ; how much was he paid for both ?

11. The number of ladies at a normal school during a certain year was 539 and the number of men 221 ; how many were there of both ? By how many did the former exceed the latter ?

12. My brother earned \$1.75 on Monday, \$1.60 on Tuesday, \$1.85 on Wednesday, \$1.35 on Thursday, and \$1.75 on Friday ; how much did he earn in the 5 days ?

13. I owed B \$100 and gave him a cow worth \$45.50 and the balance in cash ; how much cash did I give him ?

14. Find the sum of one thousand four hundred eight, three thousand forty-eight, and six hundred seventy-six.

15. Find the sum of all numbers that are greater than 1298 and less than 1304.

16. The following table gives the number of bushels of grain bought by a dealer in one week ; fill in the totals :

Grain.	Mon.	Tues.	Wed.	Thurs.	Fri.	Sat.	Total.
Wheat	235	300	201	406	327	195	
Corn	421	307	408	560	456	231	
Oats	500	480	578	401	492	324	
Rye	27	45	38	46	62	14	
Total.....							

Multiplication, Division, and Mensuration.

178. Oral Exercise.

Count by 6's :

- | | |
|------------------|------------------|
| 1. From 6 to 60. | 5. From 3 to 63. |
| 2. From 60 to 6. | 6. From 4 to 64. |
| 3. From 1 to 61. | 7. From 5 to 65. |
| 4. From 2 to 62. | 8. From 65 to 5. |

Count by 7's :

- | | |
|-------------------|-------------------|
| 9. From 7 to 70. | 13. From 3 to 73. |
| 10. From 70 to 7. | 14. From 4 to 74. |
| 11. From 1 to 71. | 15. From 5 to 75. |
| 12. From 2 to 72. | 16. From 6 to 76. |

179. Exercise.

Copy, supplying the missing numbers :

$5 \times 1 + 1 = .$	$5 \times 4 + 4 = .$	$5 \times 7 + 7 = .$
$6 \times 1 = .$	$6 \times 4 = .$	$6 \times 7 = .$
$5 \times 2 + 2 = .$	$5 \times 5 + 5 = .$	$5 \times 8 + 8 = .$
$6 \times 2 = .$	$6 \times 5 = .$	$6 \times 8 = .$
$5 \times 3 + 3 = .$	$5 \times 6 + 6 = .$	$5 \times 9 + 9 = .$
$6 \times 3 = .$	$6 \times 6 = .$	$6 \times 9 = .$

180. Exercise.

Copy, supplying the missing numbers and learn :

TABLE.

$6 \times 1 = .$	$6 \times 4 = .$	$6 \times 7 = .$
$6 \times 2 = .$	$6 \times 5 = .$	$6 \times 8 = .$
$6 \times 3 = .$	$6 \times 6 = .$	$6 \times 9 = .$

181. Exercise.

Copy, supplying the missing numbers :

$6 \times 1 + 1 = .$	$6 \times 4 + 4 = .$	$6 \times 7 + 7 = .$
$7 \times 1 = .$	$7 \times 4 = .$	$7 \times 7 = .$
$6 \times 2 + 2 = .$	$6 \times 5 + 5 = .$	$6 \times 8 + 8 = .$
$7 \times 2 = .$	$7 \times 5 = .$	$7 \times 8 = .$
$6 \times 3 + 3 = .$	$6 \times 6 + 6 = .$	$6 \times 9 + 9 = .$
$7 \times 3 = .$	$7 \times 6 = .$	$7 \times 9 = .$

182. Exercise.

Copy, supplying the missing numbers and learn :

$7 \times 1 = .$	$7 \times 4 = .$	$7 \times 7 = .$
$7 \times 2 = .$	$7 \times 5 = .$	$7 \times 8 = .$
$7 \times 3 = .$	$7 \times 6 = .$	$7 \times 9 = .$

183. Oral Exercise.

Read, supplying the missing numbers :

- | | | |
|-----------------------|-----------------------|-----------------------|
| 1. $6 \times 3 = .$ | 19. $. \times 6 = 42$ | 37. $. \times 1 = 6$ |
| 2. $7 \times 7 = .$ | 20. $6 \times 2 = .$ | 38. $6 \times 4 = .$ |
| 3. $7 \times . = 49$ | 21. $. \times 4 = 24$ | 39. $7 \times . = 42$ |
| 4. $7 \times 9 = .$ | 22. $7 \times . = 21$ | 40. $7 \times . = 63$ |
| 5. $7 \times 4 = .$ | 23. $6 \times 5 = .$ | 41. $6 \times . = 12$ |
| 6. $6 \times 8 = .$ | 24. $. \times 2 = 14$ | 42. $. \times 7 = 42$ |
| 7. $7 \times . = 28$ | 25. $. \times 6 = 36$ | 43. $6 \times 6 = .$ |
| 8. $. \times 7 = 49$ | 26. $. \times 8 = 56$ | 44. $6 \times . = 24$ |
| 9. $6 \times 7 = .$ | 27. $6 \times 1 = .$ | 45. $7 \times 7 = .$ |
| 10. $. \times 2 = 12$ | 28. $6 \times . = 42$ | 46. $6 \times . = 30$ |
| 11. $6 \times . = 36$ | 29. $6 \times 9 = .$ | 47. $6 \times . = 6$ |
| 12. $7 \times 5 = .$ | 30. $6 \times . = 54$ | 48. $7 \times . = 35$ |
| 13. $7 \times 6 = .$ | 31. $. \times 9 = 54$ | 49. $. \times 3 = 18$ |
| 14. $. \times 8 = 48$ | 32. $. \times 9 = 63$ | 50. $. \times 5 = 35$ |
| 15. $. \times 4 = 28$ | 33. $. \times 1 = 7$ | 51. $7 \times 2 = .$ |
| 16. $7 \times 2 = .$ | 34. $6 \times . = 18$ | 52. $. \times 3 = 21$ |
| 17. $. \times 5 = 30$ | 35. $7 \times 1 = .$ | 53. $6 \times . = 48$ |
| 18. $7 \times . = 56$ | 36. $7 \times 8 = .$ | 54. $7 \times 3 = .$ |

184. Exercise.

1. Find the cost of these groceries together :

6 pounds of sugar at 5 cents a pound.

2 pounds of crackers at 5 cents a pound.

2 quarts of vinegar at 4 cents a quart.

2. In a room there are 7 rows of desks and in each row 8 desks ; how many desks are there in all ?

3. A man who sleeps 9 hours a day sleeps how long each week ?

4. A farmer bought 6 lambs at 4 dollars apiece and sold them at 5 dollars apiece ; how much did he make on each lamb ? How much on the 6 lambs ?

5. In 6 bushels there are — pecks.

6. In 7 pecks there are — quarts.

7. Mr. Brown gave 3 boxes of strawberries at 8 cents a box for syrup at 6 cents a quart ; how many quarts did he receive ?

8. A lady spends 6 cents a day for milk ; how much is that a week ?

9. Show by dots that $6 \times 3 = 18$.

10. 1 dozen pigeons will make how many pair ?

11. How many bushels will 7 two-bushel bags hold ?

12. How many pencils are there in 7 boxes, if each box contains 6 pencils ?

185. Each of the six equal parts of a number is called *one sixth* ($\frac{1}{6}$) of it.

186. Each of the seven equal parts of a number is called *one seventh* ($\frac{1}{7}$) of it.

187. Exercise.

Copy, writing the proper figures in place of x:

- | | | |
|----------------------------|-----------------------------|-----------------------------|
| 1. $\frac{1}{6}$ of 6 = x | 7. $\frac{1}{6}$ of 42 = x | 13. $\frac{1}{4}$ of 28 = x |
| 2. $\frac{1}{6}$ of 12 = x | 8. $\frac{1}{6}$ of 48 = x | 14. $\frac{1}{4}$ of 35 = x |
| 3. $\frac{1}{6}$ of 18 = x | 9. $\frac{1}{6}$ of 54 = x | 15. $\frac{1}{4}$ of 42 = x |
| 4. $\frac{1}{6}$ of 24 = x | 10. $\frac{1}{7}$ of 7 = x | 16. $\frac{1}{4}$ of 49 = x |
| 5. $\frac{1}{6}$ of 30 = x | 11. $\frac{1}{7}$ of 14 = x | 17. $\frac{1}{4}$ of 56 = x |
| 6. $\frac{1}{6}$ of 36 = x | 12. $\frac{1}{7}$ of 21 = x | 18. $\frac{1}{4}$ of 63 = x |

188. Oral Exercise.

Read Exercise 187, supplying the missing numbers.

189. Exercise.

Copy, supplying the missing numbers :

- | | | |
|----------------------------|----------------------------|-----------------------------|
| 1. $12 = \text{— twos.}$ | 7. $30 = \text{— fives.}$ | 13. $63 = \text{— nines.}$ |
| 2. $7 = \text{— ones.}$ | 8. $24 = \text{— fours.}$ | 14. $42 = \text{— sevens.}$ |
| 3. $14 = \text{— twos.}$ | 9. $48 = \text{— eights.}$ | 15. $35 = \text{— fives.}$ |
| 4. $18 = \text{— threes.}$ | 10. $42 = \text{— sixes.}$ | 16. $36 = \text{— sixes.}$ |
| 5. $6 = \text{— ones.}$ | 11. $28 = \text{— fours.}$ | 17. $40 = \text{— sevens.}$ |
| 6. $21 = \text{— threes.}$ | 12. $54 = \text{— nines.}$ | 18. $56 = \text{— eights.}$ |

190. Oral Exercise.

Read Exercise 189, supplying the missing numbers.

191. Exercise.

1. Divide 12 cards equally among 6 boys. What part of them will each boy receive? How many will each boy receive?

2. How many yards of carpet are there in a piece 21 feet long?

3. 48 girls are marching 6 in a row; how many rows are there?

4. How many 5-cent pieces should I get in exchange for 30 cents?

5. 3 gallons of syrup will fill how many 2-quart jars?

6. How long will 3 pecks of oats last a horse that eats 4 quarts a day?

7. In 28 days there are — weeks.

8. At 4 for a cent, how much must I pay for 28 rivets ?

9. How many yards of muslin at 8 cents a yard can be bought for 8 quarts of plums at 6 cents a quart ?

10. A boy earned 54 dollars in six months ; how much was he paid a month ?

11. A dozen will make how many pair ?

12. How many working days are there in a week ?

13. A man who earns 3 dollars each working day earns how much in a week ?

14. 6 pounds of lard at 8 cents a pound, and how many cents, will pay for a 50-cent bucket ?

192. Oral Exercise.

Count by 8's :

1. From 8 to 80.

6. From 4 to 84.

2. From 80 to 8.

7. From 5 to 85.

3. From 1 to 81.

8. From 6 to 86.

4. From 2 to 82.

9. From 7 to 87.

5. From 3 to 83.

10. From 8 to 88.

Count by 9's :

11. From 9 to 90.

16. From 4 to 94.

12. From 90 to 9.

17. From 5 to 95.

13. From 1 to 91.

18. From 6 to 96.

14. From 2 to 92.

19. From 7 to 97.

15. From 3 to 93.

20. From 8 to 98.

193. Exercise.

Copy, supplying the missing numbers :

$7 \times 1 + 1 = .$	$7 \times 4 + 4 = .$	$7 \times 7 + 7 = .$
$8 \times 1 = .$	$8 \times 4 = .$	$8 \times 7 = .$
$7 \times 2 + 2 = .$	$7 \times 5 + 5 = .$	$7 \times 8 + 8 = .$
$8 \times 2 = .$	$8 \times 5 = .$	$8 \times 8 = .$
$7 \times 3 + 3 = .$	$7 \times 6 + 6 = .$	$7 \times 9 + 9 = .$
$8 \times 3 = .$	$8 \times 6 = .$	$8 \times 9 = .$

194. Exercise.

Copy, supplying the missing numbers, and learn :

TABLE.

$8 \times 1 = .$	$8 \times 4 = .$	$8 \times 7 = .$
$8 \times 2 = .$	$8 \times 5 = .$	$8 \times 8 = .$
$8 \times 3 = .$	$8 \times 6 = .$	$8 \times 9 = .$

195. Exercise.

Copy, supplying the missing numbers :

$8 \times 1 + 1 = .$	$8 \times 4 + 4 = .$	$8 \times 7 + 7 = .$
$9 \times 1 = .$	$9 \times 4 = .$	$9 \times 7 = .$
$8 \times 2 + 2 = .$	$8 \times 5 + 5 = .$	$8 \times 8 + 8 = .$
$9 \times 2 = .$	$9 \times 5 = .$	$9 \times 8 = .$
$8 \times 3 + 3 = .$	$8 \times 6 + 6 = .$	$8 \times 9 + 9 = .$
$9 \times 3 = .$	$9 \times 6 = .$	$9 \times 9 = .$

196. Exercise.

Copy, supplying the missing numbers, and learn :

TABLE.

$9 \times 1 = .$	$9 \times 4 = .$	$9 \times 7 = .$
$9 \times 2 = .$	$9 \times 5 = .$	$9 \times 8 = .$
$9 \times 3 = .$	$9 \times 6 = .$	$9 \times 9 = .$

197. Oral Exercise.

Read, supplying the missing numbers :

- | | | |
|---------------------------|---------------------------|---------------------------|
| 1. $8 \times 2 = \cdot$ | 19. $9 \times \cdot = 63$ | 37. $\cdot \times 1 = 8$ |
| 2. $\cdot \times 7 = 63$ | 20. $\cdot \times 9 = 81$ | 38. $\cdot \times 5 = 45$ |
| 3. $\cdot \times 1 = 9$ | 21. $9 \times \cdot = 36$ | 39. $9 \times \cdot = 72$ |
| 4. $8 \times 8 = \cdot$ | 22. $9 \times 5 = \cdot$ | 40. $8 \times 7 = \cdot$ |
| 5. $9 \times 7 = \cdot$ | 23. $8 \times \cdot = 56$ | 41. $9 \times 9 = \cdot$ |
| 6. $\cdot \times 9 = 72$ | 24. $9 \times 3 = \cdot$ | 42. $\cdot \times 6 = 54$ |
| 7. $\cdot \times 8 = 72$ | 25. $\cdot \times 2 = 18$ | 43. $\cdot \times 4 = 36$ |
| 8. $8 \times 6 = \cdot$ | 26. $9 \times \cdot = 9$ | 44. $9 \times \cdot = 27$ |
| 9. $9 \times 8 = \cdot$ | 27. $9 \times 1 = \cdot$ | 45. $9 \times 6 = \cdot$ |
| 10. $8 \times \cdot = 72$ | 28. $\cdot \times 2 = 16$ | 46. $\cdot \times 6 = 48$ |
| 11. $8 \times \cdot = 32$ | 29. $8 \times \cdot = 40$ | 47. $9 \times \cdot = 18$ |
| 12. $8 \times \cdot = 16$ | 30. $8 \times \cdot = 24$ | 48. $8 \times \cdot = 8$ |
| 13. $8 \times 5 = \cdot$ | 31. $8 \times 1 = \cdot$ | 49. $9 \times \cdot = 54$ |
| 14. $\cdot \times 8 = 64$ | 32. $\cdot \times 4 = 36$ | 50. $\cdot \times 7 = 56$ |
| 15. $9 \times 4 = \cdot$ | 33. $8 \times 4 = \cdot$ | 51. $9 \times \cdot = 81$ |
| 16. $8 \times 9 = \cdot$ | 34. $8 \times 3 = \cdot$ | 52. $\cdot \times 3 = 27$ |
| 17. $\cdot \times 5 = 40$ | 35. $9 \times \cdot = 45$ | 53. $\cdot \times 3 = 24$ |
| 18. $8 \times \cdot = 64$ | 36. $9 \times 2 = \cdot$ | 54. $8 \times \cdot = 48$ |

198. Exercise.

1. In 8 gallons there are — quarts.
2. In 8 weeks there are — days.
3. In 8 pecks there are — quarts.
4. $8 \times 2 + \cdot = 9 \times 2$.
5. 9 three-bushel bags will hold how much wheat ?
6. 8 two-cent stamps will cost how much ?
7. At 4 dollars a hundred, what will 9 hundred cabbage plants cost ?

8. What should be paid for 9 dozen herrings at 8 cents a dozen ?

9. What should be paid for 8 hundred rails at 6 dollars a hundred ?

10. How many feet long is a fishing line 8 yards long ?

11. How many persons are seated in a dining-room at 6 tables, if there are 8 persons at each table ?

12. A drover sold 8 pair of mules and one more ; how many did he sell ?

13. After a farmer sold 8 bags of wheat each holding 3 bushels, he had 5 bushels left ; how many had he at first ?

14. In 1 bushel there are — pecks, and in 1 peck there are — quarts ; then in 1 bushel there are — times — quarts, or — quarts.

15. Show that there are 8 pints in a gallon.

199. Each of the 8 equal parts of a number is *one eighth* ($\frac{1}{8}$) of it.

200. Each of the 9 equal parts of a number is *one ninth* ($\frac{1}{9}$) of it.

201. Exercise.

Copy, writing the proper figures in place of x :

- | | | |
|----------------------------|-----------------------------|-----------------------------|
| 1. $\frac{1}{8}$ of 8 = x | 7. $\frac{1}{8}$ of 56 = x | 13. $\frac{1}{3}$ of 36 = x |
| 2. $\frac{1}{8}$ of 16 = x | 8. $\frac{1}{8}$ of 64 = x | 14. $\frac{1}{3}$ of 45 = x |
| 3. $\frac{1}{8}$ of 24 = x | 9. $\frac{1}{8}$ of 72 = x | 15. $\frac{1}{3}$ of 54 = x |
| 4. $\frac{1}{8}$ of 32 = x | 10. $\frac{1}{9}$ of 9 = x | 16. $\frac{1}{3}$ of 63 = x |
| 5. $\frac{1}{8}$ of 40 = x | 11. $\frac{1}{9}$ of 18 = x | 17. $\frac{1}{3}$ of 72 = x |
| 6. $\frac{1}{8}$ of 48 = x | 12. $\frac{1}{9}$ of 27 = x | 18. $\frac{1}{3}$ of 81 = x |

202. Oral Exercise.

Read Exercise 201, supplying the missing numbers.

203. Exercise.

Copy, supplying the missing numbers :

- | | | |
|----------------------------|----------------------------|-----------------------------|
| 1. $8 = \text{— ones.}$ | 7. $27 = \text{— threes.}$ | 13. $72 = \text{— nines.}$ |
| 2. $18 = \text{— twos.}$ | 8. $56 = \text{— sevens.}$ | 14. $64 = \text{— eights.}$ |
| 3. $24 = \text{— threes.}$ | 9. $45 = \text{— fives.}$ | 15. $40 = \text{— fives.}$ |
| 4. $32 = \text{— fours.}$ | 10. $36 = \text{— fours.}$ | 16. $63 = \text{— sevens.}$ |
| 5. $9 = \text{— ones.}$ | 11. $48 = \text{— sixes.}$ | 17. $72 = \text{— eights.}$ |
| 6. $16 = \text{— twos.}$ | 12. $54 = \text{— sixes.}$ | 18. $81 = \text{— nines.}$ |

204. Oral Exercise.

Read Exercise 203, supplying the missing numbers.

205. Exercise.

1. 18 cents will buy — 2-cent stamps.
2. How many 8-foot logs can be cut from a log 40 feet long ?
3. Make and solve a problem about $\frac{1}{2}$ of 16 boys.
4. 800 posts cost 56 dollars ; how much was that for each hundred posts.
5. My brother and I bought 9 dozen tomato plants for 72 cents ; how much was that a dozen ? How much should he pay if he took 6 dozen ?
6. A log 42 feet long will make a 10-foot log and how many 4-foot logs ?
7. A grocer put 40 pounds of sugar in 8 sacks of the same size ; how much did he put in each sack ?

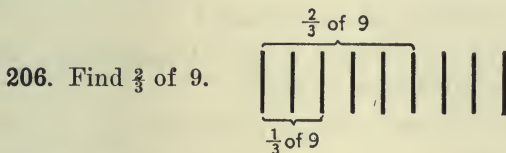
8. A farmer had 20 pigs. He kept 4 of them and sold the rest ; how many pair did he sell ?

9. How many 5-dollar bills should I get for 45 silver dollars ?

10. A farmer needs 24 pounds of twine to bind his wheat ; how many 3-pound balls must he buy ?

11. A woman sold a dealer chickens at 8 cents a pound ; he paid her 72 cents for them ; how many pounds did she sell him ?

12. I wish to plant 64 trees in 8 rows ; how many must I put in a row ?



Find $\frac{2}{3}$ of 15.

$\frac{1}{3}$ of 15 is 5, and $\frac{2}{3}$ of 15 is 2 times 5 or 10.

207. Oral Exercise.

Find :

- | | | | |
|-------------------------|-------------------------|--------------------------|--------------------------|
| 1. $\frac{2}{3}$ of 6. | 5. $\frac{2}{3}$ of 12. | 9. $\frac{3}{4}$ of 28. | 13. $\frac{2}{6}$ of 20. |
| 2. $\frac{2}{3}$ of 3. | 6. $\frac{2}{3}$ of 21. | 10. $\frac{3}{4}$ of 32. | 14. $\frac{3}{6}$ of 30. |
| 3. $\frac{2}{3}$ of 9. | 7. $\frac{3}{4}$ of 12. | 11. $\frac{3}{4}$ of 24. | 15. $\frac{3}{6}$ of 45. |
| 4. $\frac{2}{3}$ of 15. | 8. $\frac{3}{4}$ of 16. | 12. $\frac{2}{6}$ of 10. | 16. $\frac{4}{6}$ of 25. |

208. Exercise.

1. $\frac{1}{3}$ of 27 ct. is — ct. ; and $\frac{2}{3}$ of 27 ct. is 2 times — ct., or — ct.

2. What is $\frac{2}{3}$ of 6 pounds ?

3. What is $\frac{2}{3}$ of 12 quarts ?
4. $\frac{1}{4}$ of 16 bushels is — bushels, and $\frac{3}{4}$ of 16 bushels is 3 times — bushels, or — bushels.
5. Find $\frac{3}{4}$ of 12 oranges.
6. Find $\frac{2}{3}$ of 10 cents.
7. If 18 cents was the cost of 3 pounds of sugar, $\frac{1}{3}$ of 18 cents, or — cents, was the cost of 1 pound, and 2 times — cents, or — cents, was the cost of 2 pounds.
8. How much should be paid for 2 pencils, if 3 pencils cost 15 cents ?
9. A baker charged me 12 cents for 3 loaves of bread ; what should he charge me for 2 loaves ?
10. If 3 horses are fed 24 quarts of oats a day, how much does that allow for 2 horses ?
11. I owed a 16-dollar store bill and paid $\frac{3}{4}$ of it ; how much did I pay ?
12. Martha is 20 years old and May is $\frac{3}{5}$ as old ; how old is May ?
13. A boy paid 10 cents for a tablet, and $\frac{3}{5}$ as much for a ruler ; how much did he pay for both ?
14. If 5 loaves of bread cost 30 cents, 1 loaf costs $\frac{1}{5}$ of 30 cents, or — cents ; and 4 loaves cost 4 times — cents, or — cents.
15. What should I be paid for 3 days' work, if I was paid 15 dollars for 5 days' work ?
16. A boy was given 25 words to spell ; he missed $\frac{2}{5}$ of them ; how many did he spell correctly ?
17. There are 21 dots in three rows, each containing the same number ; how many dots are there in 2 rows ?

18. A grocer charged me 9 cents for 3 lemons, but one of them was bad ; how much should he have charged me for the good lemons ?

19. I just paid \$30 for 3 months' rent ; I now wish to pay 2 months' rent in advance ; how much should I pay ?

20. If 4 persons use 8 pounds of meat a week, how much should 5 persons use ?

209. Exercise.

Copy and multiply :

1. 27	6. 19	11. 18	16. 13	21. 128	26. 123
<u>6</u>	<u>7</u>	<u>8</u>	<u>9</u>	<u>8</u>	<u>8</u>

2. 39	7. 28	12. 26	17. 24	22. 109	27. 109
<u>6</u>	<u>7</u>	<u>8</u>	<u>9</u>	<u>7</u>	<u>8</u>

3. 58	8. 36	13. 74	18. 37	23. 138	28. 108
<u>6</u>	<u>7</u>	<u>8</u>	<u>9</u>	<u>7</u>	<u>9</u>

4. 66	9. 54	14. 93	19. 55	24. 145	29. 117
<u>6</u>	<u>7</u>	<u>8</u>	<u>9</u>	<u>6</u>	<u>8</u>

5. 79	10. 70	15. 50	20. 86	25. 139	30. 122
<u>6</u>	<u>7</u>	<u>8</u>	<u>9</u>	<u>6</u>	<u>8</u>

210. Multiply \$2.38 by 6.

\$2.38 Multiply as in ordinary numbers, and place the
6 decimal point before the last two figures of the
\$14.28 product to separate dollars from cents.

211. Exercise.

Multiply:

1. \$4.28	3. \$0.56	5. \$48.07	7. \$27.08
<u>4</u>	<u>9</u>	<u>8</u>	<u>8</u>

2. \$8.72	4. \$138.40	6. \$94.18	8. \$125.15
<u>7</u>	<u>6</u>	<u>9</u>	<u>5</u>

9. \$3.25 by 5. 11. \$21.38 by 8. 13. \$38.90 by 7.
 10. \$19.20 by 6. 12. \$75.03 by 9. 14. \$1025.03 by 8.

212. Exercise.

Copy and fill in the missing amounts in the following:

1. The cost of:

6 plum trees at \$1.25 each = \$....
 8 peach trees at \$0.80 each =
 7 pear trees at \$1.10 each =
 9 apple trees at \$0.75 each =
 Total = \$....

2. The cost of:

4 kegs of nails at \$2.75 each = \$....
 6 bushels of clover seed at
 \$5.75 each =
 7 tons of bran at \$18.60 each =
 8 tons of coal at \$5.75 each =
 Total = \$....

3. The cost of :

9 sheep at \$6.75 each..... = \$....

5 horses at \$125 per head. =

8 cows at \$40.50 per head. =

8 hogs at \$8.75 per head.. =

Total..... = \$....

213. Exercise.

1. Find the cost of 6 yards of cloth at 15 cents a yard.
2. A car that makes 24 trips a day makes how many trips a week ?
3. How many hours are there in a week ?
4. A gardener planted 8 rows of trees ; he planted 16 trees in each row ; how many trees did he plant in all ?
5. A farmer sold 8 loads of wheat ; there were 25 bushels in each load ; how many bushels were there in all ?
6. A bushel of potatoes weighs 60 pounds ; find the weight of 8 bushels of potatoes.
7. A bushel of corn weighs 56 pounds ; find the weight of 6 bags of corn, each holding 3 bushels.
8. How many eggs will 9 crates hold, if each crate holds 6 dozen ?
9. How many persons can be seated in 8 rows of chairs, if there are 38 chairs in each row ?
10. How many persons can be seated in 6 cars, if there are 36 seats in each car and 2 persons can sit on each seat ?
11. A dealer sold to each of 8 men 125 barrels of flour and has 50 barrels left ; how many barrels had he at first ?

12. My lot cost \$125, and my house 6 times as much ; how much did they both cost ?

214. Oral Exercise.

20	30	40	50	60	70	80	90
----	----	----	----	----	----	----	----

Multiply each of the numbers above the line

1. By 2.

Thus, 2 times 20 are 40 ; 2 times 30 are 60 ; etc.

2. By 3. 4. By 5. 6. By 7. 8. By 9.

3. By 4. 5. By 6. 7. By 8.

215. Oral Exercise.

Multiply :

1. 25 by 3.

Thus, 3 times 20 are 60 and 3 times 5 are 15 ; 60 and 15 are 75.

2. 32 by 2. 9. 43 by 5. 16. 62 by 7.

3. 48 by 2. 10. 38 by 5. 17. 84 by 8.

4. 34 by 3. 11. 66 by 5. 18. 15 by 8.

5. 25 by 3. 12. 72 by 6. 19. 36 by 8.

6. 43 by 4. 13. 43 by 6. 20. 62 by 9.

7. 56 by 4. 14. 25 by 6. 21. 25 by 8.

8. 66 by 4. 15. 75 by 6. 22. 36 by 8.

216. Exercise.

1. What is the cost of 2 handkerchiefs at 18 cents each ?

2. What is the cost of 3 hatchets at 30 cents each ?

3. How many boxes of rivets are there in 6 packages, each package containing a dozen boxes ?

4. How many yards of picture cord are there in 4 coils, each containing 25 yards ?

5. A lady bought 2 yards of gingham at 18 cents a yard; how much change should she receive from 50 cents?

There are 16 ounces (oz.) in a pound (lb.) avoirdupois.

6. How many ounces are there in 5 pounds avoirdupois?

7. How many ounces are there in 3 pounds 2 ounces?

8. 4 strips of carpet, each 8 yards long, are needed to carpet a certain floor; how many yards are required?

9. Find the cost of 3 yards of muslin at 12 cents a yard, and 3 yards of flannel at 20 cents a yard.

10. How much should a trader pay for 2 dozen eggs at 15 cents a dozen and 3 pounds of butter at 20 cents a pound?

11. How many are 4 score and 10?

12. How many are a half dozen dozen?

13. How much should a bushel of potatoes cost at 15 cents a peck?

14. How much is received for a gallon of cream at 16 cents a quart?

15. If a peck of clover seed weighs 15 pounds, what does a bushel weigh?

16. The distance between two towns is 12 miles; how far does a motorman ride each day, if he makes 4 round trips on a trolley line connecting these towns?

217. 3 rows of 4 dots each contain as many dots as 4 columns of 3 dots each, which shows that $3 \times 4 = 4 \times 3$.



218. Oral Exercise.

Multiply :

1. 2 by 20. Thus, 20 times 2 equals 2 times 20, or 40.
 2. 2 by 25. 6. 3 by 60. 10. 4 by 60. 14. 6 by 48.
 3. 2 by 40. 7. 3 by 25. 11. 5 by 25. 15. 7 by 14.
 4. 2 by 26. 8. 3 by 42. 12. 5 by 50. 16. 8 by 24.
 5. 2 by 54. 9. 3 by 18. 13. 6 by 36. 17. 9 by 31.

219. Exercise.

1. A boy sold 24 newspapers at 2 cents each ; how much did he receive for them ?

Since he sold one newspaper for 2 cents, he sold 24 for 24 times 2 cents, which equals 2 times 24 cents, or — cents.

2. Find the cost of 20 two-cent postage stamps.

3. A trolley car conductor collected on one trip 5 cents from each of 18 persons ; how much did he collect ?

4. How many persons are seated at 16 tables, if there are 4 persons at each table ?

5. How many days are there in 21 weeks ?

6. How much does it cost to ride 28 miles on a railroad, if the fare is 3 cents a mile ?

7. If school is in session 5 hours a day for 20 days of a month, how many hours is it in session in a month ?

8. Find the gain on a dozen tablets bought for 50 cents and sold at 6 cents each.

220. Find the cost of 126 yards of cloth at 5¢ a yard.

\$1.26 $126 \times 5¢ = \text{the cost.}$

5 But $126 \times 5¢ = 5 \times 126¢$, or $5 \times \$1.26$.

\$6.30 Therefore, $5 \times \$1.26$, or $\$6.30 = \text{the cost.}$

In practice, multiply by the smaller number.

221. Exercise.

Find the cost of :

1. 126 bushels of seed at \$5 per bushel.
2. 228 pounds of soap at 5¢ per pound.
3. 476 pounds of sugar at 6¢ per pound.
4. 208 quarts of milk at 6¢ per quart.
5. 165 barrels of apples at \$4 per barrel.
6. 125 yards of carpet at \$2 per yard.
7. 288 fruit trees at \$1 each.
8. 385 gallons of oil at 9¢ per gallon.
9. A bushel of chestnuts at 8¢ a quart.
10. 75 cans of corn at 8¢ each.

222. Exercise.

Copy and divide :

- | | | | |
|-----------------------|-------------------------|-------------------------|-------------------------|
| 1. $6 \overline{)66}$ | 10. $7 \overline{)84}$ | 19. $6 \overline{)954}$ | 28. $8 \overline{)624}$ |
| 2. $6 \overline{)60}$ | 11. $8 \overline{)96}$ | 20. $6 \overline{)750}$ | 29. $8 \overline{)920}$ |
| 3. $7 \overline{)77}$ | 12. $7 \overline{)98}$ | 21. $7 \overline{)147}$ | 30. $8 \overline{)704}$ |
| 4. $7 \overline{)70}$ | 13. $6 \overline{)102}$ | 22. $7 \overline{)791}$ | 31. $9 \overline{)819}$ |
| 5. $8 \overline{)88}$ | 14. $9 \overline{)108}$ | 23. $7 \overline{)812}$ | 32. $9 \overline{)765}$ |
| 6. $6 \overline{)84}$ | 15. $8 \overline{)104}$ | 24. $7 \overline{)903}$ | 33. $9 \overline{)648}$ |
| 7. $6 \overline{)90}$ | 16. $6 \overline{)366}$ | 25. $7 \overline{)814}$ | 34. $9 \overline{)531}$ |
| 8. $6 \overline{)96}$ | 17. $6 \overline{)672}$ | 26. $8 \overline{)248}$ | 35. $9 \overline{)396}$ |
| 9. $7 \overline{)91}$ | 18. $6 \overline{)804}$ | 27. $8 \overline{)896}$ | 36. $9 \overline{)612}$ |

223. Divide \$18.75 by 5.

$$\begin{array}{r} 5 \overline{) \$18.75} \\ \$ 3.75 \end{array}$$

Divide as in ordinary numbers, and place the decimal before the last two figures to separate dollars from cents.

224. Exercise.

Divide :

- | | | |
|----------------|-----------------|---------------------|
| 1. $2)\$18.72$ | 5. $7)\$35.14$ | 9. $\$178.50$ by 5 |
| 2. $3)\$31.05$ | 6. $9)\$193.05$ | 10. $\$374.24$ by 4 |
| 3. $6)\$15.48$ | 7. $5)\$100.10$ | 11. $\$127.00$ by 5 |
| 4. $8)\$33.60$ | 8. $6)\$127.08$ | 12. $\$38.07$ by 9 |

225. Exercise.

Find the cost of 1 pound of each, if :

1. 6 lb. of coffee cost \$2.10.
2. 8 lb. of dried beef cost \$2.00.
3. 5 lb. of ham cost \$0.80.
4. 4 lb. of tea cost \$2.80.
5. 7 lb. of butter cost \$1.96.
6. 9 lb. of cheese cost \$1.44.
7. 3 lb. of yarn cost \$1.05.
8. 8 lb. of prunes cost \$1.20.

226. Exercise.

1. A lady bought 6 yards of cloth for 96 cents ; how much was it a yard ?

2. A dealer sold 6 horses for \$900 ; he received the same sum for each ; how much did he receive for each ?

3. 7 men caught 819 shad and shared them equally ; how many did each receive ?

4. A man earned \$84 in 6 weeks and his son earned \$66 ; how much did both earn ? How much did both earn in a week ?

5. A man rode 644 miles on Tuesday and $\frac{1}{4}$ as far on Wednesday ; how far did he ride in the two days ?

6. In 9 class-rooms there are 405 desks ; if each room contains the same number of desks, how many are there in each room ?

7. A dealer had 500 dressed chickens ; he sold 68 of them and shipped the others in 6 barrels of equal size ; how many did he put in each barrel ?

8. Divide $818 - 106$ by 8.

9. I owed \$718, and paid \$32 ; I wish to pay the rest in 6 equal parts ; how much must I pay in each part ?

10. Make and solve a problem about 672 trees that were sold during 6 days.

11. Divide $386 + 428 - 128$ by 7.

12. Divide \$648 among 3 persons, giving the first person $\frac{1}{3}$ of the money, the second $\frac{1}{3}$ of it, and the third the remainder.

227. Exercise.

Measure :

- | | | |
|--------------|--------------|---------------|
| 1. 96 by 6. | 5. 402 by 6. | 9. 801 by 9. |
| 2. 108 by 9. | 6. 833 by 7. | 10. 726 by 6. |
| 3. 272 by 8. | 7. 504 by 9. | 11. 749 by 7. |
| 4. 896 by 7. | 8. 376 by 8. | 12. 816 by 8. |

228. Measure \$12.05 by \$0.05.

$$\$12.05 : \$0.05 = 1205\phi : 5\phi = 1205 \div 5, \text{ or } 241.$$

229. Exercise.

Measure :

- | | |
|-----------------------|--------------------|
| 1. \$4.24 by \$0.04. | 7. \$12.72 by 6¢. |
| 2. \$5 by 5¢. | 8. \$0.96 by 4¢. |
| 3. \$18.36 by \$0.09. | 9. \$12.50 by 5¢. |
| 4. \$12.32 by \$0.08. | 10. \$12.25 by 5¢. |
| 5. \$50 by \$0.05. | 11. \$81 by 9¢. |
| 6. \$27.99 by \$0.09. | 12. \$120 by 8¢. |

230. Exercise.

Find how many can be bought :

1. 2-cent postage stamps for \$1.72.
2. 5-cent tablets for \$11.65.
3. 3-cent pencils for \$0.84.
4. 5-cent loaves of bread for \$2.40.
5. 4-cent boxes of matches for \$0.60.
6. 8-cent spools of thread for \$1.12.
7. 8-cent note books for \$3.44.
8. 5-cent spools of thread for \$1.

231. Exercise.

1. How many pecks are there in 216 quarts ?
2. How many weeks are there in 364 days ?
3. How many trains of 9 cars each can be made up from 189 cars ?
4. How many weeks will it take to get \$344 by saving \$8 a week ?
5. Find the cost of 108 marbles, if 9 are bought for a cent.

6. How many 8-cent stamps can you buy for 96 cents ?
7. How long will it take a boat to sail 224 miles, if it sails 8 miles an hour ?
8. If coal costs \$6 a ton, how many tons can be bought for \$216 ?
9. How many groups of 6 marbles each can be made with 150 marbles ?
10. A dealer bought 8 dozen hats in boxes of 6 hats each ; how many boxes were there ?
11. A dealer bought 750 cigars, and after selling 324 of them, put the rest in packages of 6 each ; how many packages had he ?
12. If the distance around a wheel is 6 feet, how many times will it turn in going 882 feet ?
13. 144 trees can be planted in rows of 6 trees each, 8 trees each, or 9 trees each ; how many rows of each kind would they make ?

232. Exercise.

1. What is each of the three equal parts of 1 called ?

2. How many thirds are there in 1 ?

3. Read : $\frac{1}{3}$; $\frac{2}{3}$; $\frac{3}{3}$.



4. What is each of the six equal parts of 1 called ?

5. What are 2 of the six equal parts of 1 called ?



6. Read : $\frac{1}{6}$; $\frac{3}{6}$; $\frac{5}{6}$; $\frac{6}{6}$; $\frac{2}{6}$; $\frac{4}{6}$.
7. In $\frac{1}{3}$ there are how many sixths ?
8. In $\frac{2}{3}$ there are how many sixths ?
9. In $\frac{1}{2}$ there are how many sixths ?
10. Show that $\frac{1}{6}$ of 2 is $\frac{2}{6}$, or $\frac{1}{3}$.
11. Show that $\frac{1}{6}$ of 3 is $\frac{3}{6}$, or $\frac{1}{2}$.
12. Show that $\frac{1}{6}$ of 4 is $\frac{4}{6}$, or $\frac{2}{3}$.
13. Show that $\frac{1}{6}$ of 5 is $\frac{5}{6}$.

233. Find $\frac{1}{6}$ of 26.

Answer thus : $\frac{1}{6}$ of 26 is 4, and 2 over ; $\frac{1}{6}$ of 2 is $\frac{2}{6}$, or $\frac{1}{3}$.

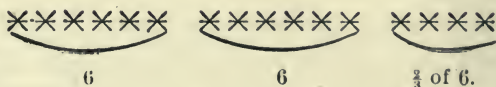
The answer is $2\frac{1}{3}$.

234. Oral Exercise.

Find :

- | | | | |
|------------------------|-------------------------|-------------------------|--------------------------|
| 1. $\frac{1}{6}$ of 7. | 4. $\frac{1}{6}$ of 13. | 7. $\frac{1}{6}$ of 28. | 10. $\frac{1}{6}$ of 34. |
| 2. $\frac{1}{6}$ of 8. | 5. $\frac{1}{6}$ of 16. | 8. $\frac{1}{6}$ of 25. | 11. $\frac{1}{6}$ of 45. |
| 3. $\frac{1}{6}$ of 9. | 6. $\frac{1}{6}$ of 20. | 9. $\frac{1}{6}$ of 40. | 12. $\frac{1}{6}$ of 50. |

235. How many 6's are there in 16 ? $16 = 2\frac{2}{3}$ sixes.



236. Exercise.

Supply the missing numbers, using drawings to illustrate :

- | | | |
|---------------------------|---------------------------|---------------------------|
| 1. $8 = \text{— sixes.}$ | 4. $15 = \text{— sixes.}$ | 7. $28 = \text{— sixes.}$ |
| 2. $9 = \text{— sixes.}$ | 5. $17 = \text{— sixes.}$ | 8. $33 = \text{— sixes.}$ |
| 3. $14 = \text{— sixes.}$ | 6. $20 = \text{— sixes.}$ | 9. $16 = \text{— sixes.}$ |

237. Exercise.

1. If 6 pounds of soap cost 25 cents, how much is the soap a pound ?

2. A dealer has 50 handkerchiefs which he wishes to put up in boxes of half a dozen each ; how many boxes will there be, and how many handkerchiefs over ?

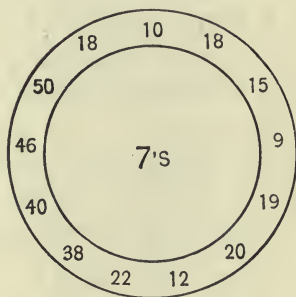
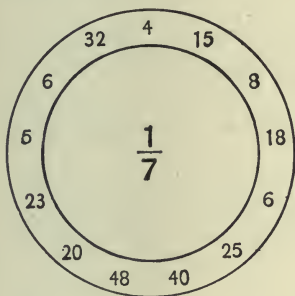
3. What is each of the seven equal parts of 1 called ?

4. Show that $\frac{1}{7}$ of 2 is $\frac{2}{7}$.

5. Read : $\frac{2}{7}$; $\frac{3}{7}$; $\frac{4}{7}$; $\frac{5}{7}$; $\frac{6}{7}$; $\frac{7}{7}$.

6. Show that there are $2\frac{2}{7}$ sevens in 16.

7. Find $\frac{1}{7}$ of each number in the outer ring of the left-hand design.



8. Find how many 7's there are in each number in the outer ring of the right-hand design.

9. 25 days are — weeks — days.

10. A man who earns 15 dollars in the 6 working days of a week earns how much a day ?

11. January has 31 days ; this is how many weeks and days ?

12. April has 30 days ; this is how many weeks and days ?

13. When board costs 10 dollars a week, how much is it per day ?

14. How many pounds of sugar at 6 cents a pound can be bought for 8 pounds of duck at 7 cents a pound ?

238. Oral Exercise.

$\frac{1}{4}$		$\frac{1}{8}$
	$\frac{1}{2}$	

1. What is each of the 8 equal parts of 1 called ?

2. How many eighths are there in 1 ?

3. How many eighths are there in $\frac{1}{4}$? in $\frac{1}{2}$?

4. How many eighths are there in $\frac{3}{4}$?

5. Read : $\frac{2}{8}$; $\frac{5}{8}$; $\frac{3}{8}$; $\frac{4}{8}$; $\frac{6}{8}$; $\frac{8}{8}$.

6. How many fourths are there in $\frac{2}{8}$? in $\frac{4}{8}$? in $\frac{6}{8}$?

7. How many halves are there in $\frac{4}{8}$? in $\frac{8}{8}$?

		$\frac{1}{9}$

8. What is each of the 9 equal parts of 1 called ?

9. How many ninths are there in 1 ?

10. How many ninths are there in $\frac{1}{3}$? in $\frac{2}{3}$?

11. Read : $\frac{2}{9}$; $\frac{5}{9}$; $\frac{6}{9}$; $\frac{8}{9}$; $\frac{7}{9}$; $\frac{9}{9}$; $\frac{3}{9}$; $\frac{4}{9}$.

12. How many thirds are there in $\frac{3}{9}$? $\frac{6}{9}$?

239. Exercise.

1. Show that $\frac{1}{2}$ of 2 is $\frac{2}{2}$, or $\frac{1}{1}$.

2. Show that $\frac{1}{2}$ of 4 is $\frac{4}{2}$, or $\frac{1}{2}$.

3. Show that $\frac{1}{2}$ of 6 is $\frac{6}{2}$, or $\frac{3}{1}$.

4. Show that $\frac{1}{3}$ of 3 is $\frac{3}{3}$, or $\frac{1}{1}$.

5. Show that $\frac{1}{3}$ of 6 is $\frac{6}{3}$, or $\frac{2}{1}$.

240. Oral Exercise.

What is :

- | | | |
|--------------------------|---------------------------|---------------------------|
| 1. $\frac{1}{8}$ of 5 ? | 6. $\frac{1}{8}$ of 30 ? | 11. $\frac{1}{9}$ of 25 ? |
| 2. $\frac{1}{8}$ of 25 ? | 7. $\frac{1}{8}$ of 35 ? | 12. $\frac{1}{9}$ of 30 ? |
| 3. $\frac{1}{8}$ of 20 ? | 8. $\frac{1}{8}$ of 42 ? | 13. $\frac{1}{9}$ of 38 ? |
| 4. $\frac{1}{8}$ of 22 ? | 9. $\frac{1}{8}$ of 50 ? | 14. $\frac{1}{9}$ of 40 ? |
| 5. $\frac{1}{8}$ of 18 ? | 10. $\frac{1}{9}$ of 12 ? | 15. $\frac{1}{9}$ of 53 ? |

241. Exercise.

- Show that there are $2\frac{1}{2}$ eights in 20.
- In 15 quarts there are — pecks — quarts.
- In 25 quarts there are — pecks — quarts.
- Show that there are $2\frac{2}{3}$ nines in 20.
- Show that there are $2\frac{1}{3}$ nines in 21.
- If a peck of plums sold for 50 cents, how much were they a quart ?
- 25 cents will pay for how many pounds of rice at 8 cents a pound, and how many cents will be left over ?
- 38 dots will make how many lines of 9 dots each, and how many dots will be over ?

242. Exercise.

- How many days are there in 6 weeks ?
- 30 quarts are — pecks — quarts.
- 2 sets of casters, 4 in a set, cost 20 cents ; how much did each caster cost ?
- Find the gain on 40 papers bought at 1 ct. each and sold at 2 ct. each.
- Since 16 ounces make a pound, how many pounds will 2 cakes of soap weigh, if each cake weighs 8 ounces ?

6. How old is a man who was 40 years old 16 years ago?
7. A trolley car that makes 2 round trips an hour over a road 3 miles long, runs how far each hour?
8. Supply the missing numbers:

$$1 = \frac{1}{2} = \frac{2}{3} = \frac{3}{4} = \frac{4}{5} = \frac{5}{6} = \frac{6}{7} = \frac{7}{8} = \frac{8}{9}$$

9. Since — pints make a quart, and — quarts make a gallon, there are — times — pints, or — pints, in a gallon.

10. At 8 cents a pint, what is the selling price of a gallon of cream?

11. A dime, a 5-cent piece, and a one-cent piece are together worth how much less than 2 dimes?

12. How many crates does a market man require to pack 54 dozen eggs, if he puts 6 dozen in a crate?

13. — pints make a gallon; how many gallons are there in 64 pints?

243. Oral Exercise.

Find:

- | | | | |
|-------------------------|--------------------------|--------------------------|--------------------------|
| 1. $\frac{5}{6}$ of 12. | 6. $\frac{2}{7}$ of 35. | 11. $\frac{6}{7}$ of 70. | 16. $\frac{7}{8}$ of 48. |
| 2. $\frac{5}{6}$ of 18. | 7. $\frac{3}{7}$ of 28. | 12. $\frac{3}{8}$ of 16. | 17. $\frac{7}{8}$ of 80. |
| 3. $\frac{5}{6}$ of 30. | 8. $\frac{3}{7}$ of 21. | 13. $\frac{3}{8}$ of 32. | 18. $\frac{2}{9}$ of 27. |
| 4. $\frac{5}{6}$ of 24. | 9. $\frac{4}{7}$ of 42. | 14. $\frac{5}{8}$ of 40. | 19. $\frac{4}{9}$ of 36. |
| 5. $\frac{2}{7}$ of 14. | 10. $\frac{5}{7}$ of 49. | 15. $\frac{5}{8}$ of 24. | 20. $\frac{5}{9}$ of 18. |

244. Exercise.

1. If 6 times a number is 30, the number is what part of 30? What is the number?

2. If 6 times a number is 24, the number is — of 24, or —; and 5 times the number is — times —, or —.

3. If 7 times a number is 56, what is 6 times the number?
4. $\frac{3}{10}$ of a score are how many?
5. A farmer had 63 sheep and sold $\frac{7}{9}$ of them; how many had he left?
6. $\frac{2}{7}$ of a week is $\frac{2}{7}$ of — days, or — days.
7. A turkey weighing 12 pounds, live weight, weighed only $\frac{5}{8}$ as much when dressed; how much did it lose in the dressing?
8. 7 cans of lard of equal size weighed 70 pounds; how much did 2 of them weigh?
9. If 6 dozen bananas cost 60 cents, what should 3 dozen cost?
10. If 6 hundred rails sold for 48 dollars, 2 hundred should sell for — dollars.
11. I have 42 tablets in 7 packages of equal size; how many tablets are there in 3 of these packages?
12. A miner earned \$30 a month and his son $\frac{3}{10}$ as much; how much did both earn a month?
13. If a turkey weighing 9 pounds sold for 90 cents, what should one weighing 8 pounds sell for?
14. In taking 8 steps a man walked 24 feet; how far had he walked when he had taken 6 steps?
15. A father gave each of his 3 sons $\frac{1}{8}$ of a farm of 56 acres; how many acres had he left?
16. If 8 times a number is 32, what is 7 times the number?
17. $\frac{4}{9}$ of 90 cents is — cents, or — dimes.
18. A carpenter bought 18 hinges for 9 doors; how many will he use to hang 4 doors?

245. Exercise—Miscellaneous Problems.

1. Write the letters used in the Roman system of notation and the number for which each stands.

2. Express by the Roman system :

19 ; 44 ; 406 ; 1909.

3. Express in figures :

XCIV ; MCD ; MCMVI ; CMI ; $\bar{\text{VIV}}$.

4. In \$7486, the 7 expresses how many dollars ? the 4 ? the 8 ?

5. $87 + 168 + 326 + 308 = ?$

6. $327 + 109 + 426 + ? = 1000$.

7. $1487 - 896 = ?$

8. $2939 - ? = 1000 ?$

9. $? - 526 = 879 ?$

10. A dealer bought seventeen hundred forty bushels of wheat and sold eleven hundred ninety bushels of it ; how much had he left ?

11. What number is 101 greater than 999 ?

12. A man bought a house costing \$7250 and paid \$4750 on it ; how much does he yet owe ?

13. A man bought a vest for \$2.75 and a pair of shoes for \$3.50 ; how much change should he receive from a \$10-bill ?

14. From twenty dollars and seventy-five cents take the sum of four dollars and twenty cents and six dollars and eighty-five cents.

15. A farmer bought a horse for \$160 and sold him so

as to gain $\frac{1}{6}$ of this sum ; find the selling price of the horse.

16. There were 1685 soldiers in a camp, but $\frac{2}{5}$ of them were sent away ; how many remained ?

17. Which is nearer 1000 and by how much, 899 or 1101 ?

18. From 4275 take 36 hundred.

19. How old was my father 25 years ago, if he is 74 years old now ?

20. If the first problem on a page is the 128th and the last the 153d, how many problems are there on the page ?

21. Add down ; add across :

$$448 + 327 + 1320 = \quad .$$

$$79 + 108 + 768 = \quad .$$

$$175 + 927 + 7856 = \quad .$$

$$8 + 128 + 96 = \quad .$$

$$\begin{array}{r} \hline . + . + . = \\ \hline \end{array}$$

22. Find the missing amounts by adding down and subtracting across. See that the answer to (7) is the sum of the amounts found for column (c).

	(a)	(b)	(c)
(1)	\$6750.20	— \$1007.50	= ?
(2)	35.25	— 20.95	= ?
(3)	180.00	— 178.25	= ?
(4)	3728.00	— 987.95	= ?
(5)	2753.60	— 8.85	= ?
(6)	27.85	— 13.70	= ?
(7)	<u>?</u>	<u>?</u>	<u>?</u>

246. The following table, called the MULTIPLICATION TABLE, shows the results obtained by taking each of the numbers from 1 to 12, inclusive, from 1 to 12 times.

MULTIPLICATION TABLE.

1 × 1 = 1	2 × 1 = 2	3 × 1 = 3	4 × 1 = 4
1 × 2 = 2	2 × 2 = 4	3 × 2 = 6	4 × 2 = 8
1 × 3 = 3	2 × 3 = 6	3 × 3 = 9	4 × 3 = 12
1 × 4 = 4	2 × 4 = 8	3 × 4 = 12	4 × 4 = 16
1 × 5 = 5	2 × 5 = 10	3 × 5 = 15	4 × 5 = 20
1 × 6 = 6	2 × 6 = 12	3 × 6 = 18	4 × 6 = 24
1 × 7 = 7	2 × 7 = 14	3 × 7 = 21	4 × 7 = 28
1 × 8 = 8	2 × 8 = 16	3 × 8 = 24	4 × 8 = 32
1 × 9 = 9	2 × 9 = 18	3 × 9 = 27	4 × 9 = 36
1 × 10 = 10	2 × 10 = 20	3 × 10 = 30	4 × 10 = 40
1 × 11 = 11	2 × 11 = 22	3 × 11 = 33	4 × 11 = 44
1 × 12 = 12	2 × 12 = 24	3 × 12 = 36	4 × 12 = 48
5 × 1 = 5	6 × 1 = 6	7 × 1 = 7	8 × 1 = 8
5 × 2 = 10	6 × 2 = 12	7 × 2 = 14	8 × 2 = 16
5 × 3 = 15	6 × 3 = 18	7 × 3 = 21	8 × 3 = 24
5 × 4 = 20	6 × 4 = 24	7 × 4 = 28	8 × 4 = 32
5 × 5 = 25	6 × 5 = 30	7 × 5 = 35	8 × 5 = 40
5 × 6 = 30	6 × 6 = 36	7 × 6 = 42	8 × 6 = 48
5 × 7 = 35	6 × 7 = 42	7 × 7 = 49	8 × 7 = 56
5 × 8 = 40	6 × 8 = 48	7 × 8 = 56	8 × 8 = 64
5 × 9 = 45	6 × 9 = 54	7 × 9 = 63	8 × 9 = 72
5 × 10 = 50	6 × 10 = 60	7 × 10 = 70	8 × 10 = 80
5 × 11 = 55	6 × 11 = 66	7 × 11 = 77	8 × 11 = 88
5 × 12 = 60	6 × 12 = 72	7 × 12 = 84	8 × 12 = 96
9 × 1 = 9	10 × 1 = 10	11 × 1 = 11	12 × 1 = 12
9 × 2 = 18	10 × 2 = 20	11 × 2 = 22	12 × 2 = 24
9 × 3 = 27	10 × 3 = 30	11 × 3 = 33	12 × 3 = 36
9 × 4 = 36	10 × 4 = 40	11 × 4 = 44	12 × 4 = 48
9 × 5 = 45	10 × 5 = 50	11 × 5 = 55	12 × 5 = 60
9 × 6 = 54	10 × 6 = 60	11 × 6 = 66	12 × 6 = 72
9 × 7 = 63	10 × 7 = 70	11 × 7 = 77	12 × 7 = 84
9 × 8 = 72	10 × 8 = 80	11 × 8 = 88	12 × 8 = 96
9 × 9 = 81	10 × 9 = 90	11 × 9 = 99	12 × 9 = 108
9 × 10 = 90	10 × 10 = 100	11 × 10 = 110	12 × 10 = 120
9 × 11 = 99	10 × 11 = 110	11 × 11 = 121	12 × 11 = 132
9 × 12 = 108	10 × 12 = 120	11 × 12 = 132	12 × 12 = 144

247. $10 \times 5 = 50$. From this we see that

Annexing a cipher to a number multiplies it by 10.

248. Oral Exercise.

Read, supplying the missing numbers :

- | | | |
|---------------------------|----------------------------|-----------------------------|
| 1. $10 \times 7 = \cdot$ | 7. $10 \times 42 = \cdot$ | 13. $10 \times 225 = \cdot$ |
| 2. $10 \times 9 = \cdot$ | 8. $10 \times 54 = \cdot$ | 14. $10 \times 201 = \cdot$ |
| 3. $10 \times 13 = \cdot$ | 9. $10 \times 61 = \cdot$ | 15. $10 \times 278 = \cdot$ |
| 4. $10 \times 17 = \cdot$ | 10. $10 \times 75 = \cdot$ | 16. $10 \times 370 = \cdot$ |
| 5. $10 \times 27 = \cdot$ | 11. $10 \times 29 = \cdot$ | 17. $10 \times 300 = \cdot$ |
| 6. $10 \times 35 = \cdot$ | 12. $10 \times 80 = \cdot$ | 18. $10 \times 990 = \cdot$ |

249. $100 \times 5 = 5 \times 100 = 500$. From this we see that

Annexing two ciphers to a number multiplies it by 100.

250. Oral Exercise.

Read, supplying the missing numbers :

- | | | |
|----------------------------|-----------------------------|-----------------------------|
| 1. $100 \times 7 = \cdot$ | 6. $100 \times 15 = \cdot$ | 11. $100 \times 70 = \cdot$ |
| 2. $100 \times 9 = \cdot$ | 7. $100 \times 35 = \cdot$ | 12. $100 \times 10 = \cdot$ |
| 3. $100 \times 2 = \cdot$ | 8. $100 \times 20 = \cdot$ | 13. $100 \times 25 = \cdot$ |
| 4. $100 \times 6 = \cdot$ | 9. $100 \times 48 = \cdot$ | 14. $100 \times 72 = \cdot$ |
| 5. $100 \times 21 = \cdot$ | 10. $100 \times 99 = \cdot$ | 15. $100 \times 69 = \cdot$ |

251. $1000 \times 5 = 5 \times 1000 = 5000$. From this we see that

Annexing three ciphers to a number multiplies it by 1000.

252. Oral Exercise.

Read, supplying the missing numbers :

1. $1000 \times 2 = \cdot$ 4. $1000 \times 1 = \cdot$ 7. $1000 \times 8 = \cdot$
2. $1000 \times 4 = \cdot$ 5. $1000 \times 9 = \cdot$ 8. $1000 \times 3 = \cdot$
3. $1000 \times 7 = \cdot$ 6. $1000 \times 5 = \cdot$ 9. $1000 \times 6 = \cdot$

253. Exercise.

1. 100 dimes are worth — cents.
2. At 15 cents a quart, how much should be received for 10 quarts of chestnuts ?
3. Find the weight of 10 shad, if they average 8 pounds a pair.
4. What must be paid for 100 postal cards ?
5. A drover bought 100 head of steers at an average of \$35 a head ; how much did he pay for them ?
6. Find the weight of 1000 two-pound sacks of salt.
7. Find the cost of a 100-acre farm at \$20 an acre.
8. How many ounces are there in 100 pounds avoirdupois ?

There are 12 months (mo.) in a year (yr.).

9. 100 years is called a century ; how many months are there in a century ?
10. A keg of nails weighs 100 pounds ; find the weight of 15 kegs of nails.

SUG. $15 \times 100 \text{ lb.} = 100 \times 15 \text{ lb.}$

11. There are 100 cents in a dollar ; how many cents are there in 5 dollars ?

254. Multiply 27 by 300.

$$\begin{array}{r} 27 \\ 300 \\ \hline 8100 \end{array}$$

Since $300 = 100 \times 3$,
 $300 \times 27 = 100 \times 3 \times 27 = 100 \times 81 = 8100$.

255. Exercise.

Find the product of :

- | | | |
|---------------------|---------------------|-----------------------|
| 1. 20×15 . | 5. 50×33 . | 9. 200×35 . |
| 2. 30×45 . | 6. 60×75 . | 10. 200×47 . |
| 3. 40×62 . | 7. 70×38 . | 11. 200×35 . |
| 4. 40×60 . | 8. 70×80 . | 12. 300×28 . |

256. Exercise.

- Find the cost of 40 sewing machines at \$28 each.
- Find the tuition paid by 45 students, if each pays \$200.

SUG. $45 \times \$200 = 200 \times \45 .

- How many feet of boards does a man buy, if he buys 500 boards each 18 feet long ?
- How much fertilizer must be bought for a 12-acre field, if 200 pounds are required for an acre ?
- A barrel of beef weighs 200 pounds ; find the weight of a shipment of 17 barrels of beef.
- How many yards are there in 12 pieces of bunting, each containing 50 yards ?
- There are 24 sheets in a quire, and 20 quires in a ream ; how many sheets are there in a ream of paper ?
- How much house rent does a man pay in 3 years, if he pays \$20 a month ?

257. Multiply 374 by 24.

$$\begin{array}{r} 374 \\ \times 24 \\ \hline 1496 \\ 748 \\ \hline 8976 \end{array}$$
 We first multiply 374 by 4, obtaining 1496 for the product. We next multiply 374 by 2, obtaining 748 for the product ; and since the 2 is 2 *tens*, we write 748 so that the 8 stands in tens' place. The sum of these products, or the entire product, is 8976.

258. Exercise.

Copy and multiply :

1. $\begin{array}{r} 43 \\ \times 13 \\ \hline \end{array}$	8. $\begin{array}{r} 72 \\ \times 87 \\ \hline \end{array}$	15. $\begin{array}{r} 59 \\ \times 57 \\ \hline \end{array}$	22. $\begin{array}{r} 342 \\ \times 13 \\ \hline \end{array}$	29. $\begin{array}{r} 198 \\ \times 39 \\ \hline \end{array}$
2. $\begin{array}{r} 64 \\ \times 26 \\ \hline \end{array}$	9. $\begin{array}{r} 79 \\ \times 77 \\ \hline \end{array}$	16. $\begin{array}{r} 86 \\ \times 76 \\ \hline \end{array}$	23. $\begin{array}{r} 452 \\ \times 14 \\ \hline \end{array}$	30. $\begin{array}{r} 276 \\ \times 42 \\ \hline \end{array}$
3. $\begin{array}{r} 94 \\ \times 28 \\ \hline \end{array}$	10. $\begin{array}{r} 81 \\ \times 98 \\ \hline \end{array}$	17. $\begin{array}{r} 38 \\ \times 57 \\ \hline \end{array}$	24. $\begin{array}{r} 209 \\ \times 16 \\ \hline \end{array}$	31. $\begin{array}{r} 378 \\ \times 28 \\ \hline \end{array}$
4. $\begin{array}{r} 85 \\ \times 52 \\ \hline \end{array}$	11. $\begin{array}{r} 45 \\ \times 56 \\ \hline \end{array}$	18. $\begin{array}{r} 92 \\ \times 21 \\ \hline \end{array}$	25. $\begin{array}{r} 390 \\ \times 21 \\ \hline \end{array}$	32. $\begin{array}{r} 309 \\ \times 27 \\ \hline \end{array}$
5. $\begin{array}{r} 95 \\ \times 36 \\ \hline \end{array}$	12. $\begin{array}{r} 99 \\ \times 91 \\ \hline \end{array}$	19. $\begin{array}{r} 47 \\ \times 19 \\ \hline \end{array}$	26. $\begin{array}{r} 409 \\ \times 21 \\ \hline \end{array}$	33. $\begin{array}{r} 290 \\ \times 39 \\ \hline \end{array}$
6. $\begin{array}{r} 96 \\ \times 49 \\ \hline \end{array}$	13. $\begin{array}{r} 65 \\ \times 37 \\ \hline \end{array}$	20. $\begin{array}{r} 51 \\ \times 99 \\ \hline \end{array}$	27. $\begin{array}{r} 580 \\ \times 22 \\ \hline \end{array}$	34. $\begin{array}{r} 409 \\ \times 26 \\ \hline \end{array}$
7. $\begin{array}{r} 57 \\ \times 65 \\ \hline \end{array}$	14. $\begin{array}{r} 48 \\ \times 23 \\ \hline \end{array}$	21. $\begin{array}{r} 427 \\ \times 12 \\ \hline \end{array}$	28. $\begin{array}{r} 214 \\ \times 24 \\ \hline \end{array}$	35. $\begin{array}{r} 275 \\ \times 27 \\ \hline \end{array}$

259. Exercise.

1. Find the weight of 25 bushels of oats, if they weigh 32 pounds to the bushel.

2. How many hours are there in May, which has 31 days?

3. How far will a steamboat run in a day, if it runs 16 miles an hour?

4. A barrel of flour weighs 196 pounds; find the weight of 6 barrels of flour.

5. Find the cost of 25 thousand feet of boards at \$32 per thousand feet.

6. Find the cost of 16 hundred fence posts at \$18 per hundred.

7. A man left \$8975 to his wife and 4 children, the children receiving \$1250 each; how much did the wife receive?

8. A dealer bought 28 grain drills at \$62 each and sold them at \$100 each; find his gain.

Sug. $\$100 - \62 , or $\$38 =$ the gain on each.

9. A farmer bought 15 steers at \$35 a head, and after feeding them for 6 months at a cost of \$40 a month, sold them at an average of \$58 a head; find his gain.

10. If a clerk's wages are \$30 a month, find his wages for a year.

11. 52 weeks and 1 day make a common year; how many days make a common year?

12. A farmer put 25 loads of lime on his land, each

load averaging 75 bushels ; how much lime did he put on his land ?

13. How many dozen eggs will 24 crates hold, if each crate holds 72 dozen ?

260. Divide 435 by 4.

$$\begin{array}{r}
 4 \overline{) 435} \\
 \underline{108\frac{3}{4}}
 \end{array}$$

$\frac{1}{4}$ of 435 = $\frac{1}{4}$ of (4 hundred + 3 tens + 5 units).
 $\frac{1}{4}$ of 4 hundred = 1 hundred.
 $\frac{1}{4}$ of 3 tens = 0 tens, and 3 tens over.
3 tens + 5 units = 35 units.
 $\frac{1}{4}$ of 35 units = 8 units, and 3 units over.
 $\frac{1}{4}$ of 3 units = $\frac{3}{4}$ of a unit. The quotient is $108\frac{3}{4}$.

261. Exercise.

Copy and divide :

- | | | | |
|-----------------------|------------------------|-------------------------|-------------------------|
| 1. $2)\underline{37}$ | 10. $5)\underline{72}$ | 19. $7)\underline{93}$ | 28. $8)\underline{500}$ |
| 2. $2)\underline{51}$ | 11. $5)\underline{83}$ | 20. $7)\underline{99}$ | 29. $8)\underline{362}$ |
| 3. $3)\underline{40}$ | 12. $5)\underline{99}$ | 21. $7)\underline{130}$ | 30. $8)\underline{815}$ |
| 4. $3)\underline{47}$ | 13. $5)\underline{93}$ | 22. $7)\underline{152}$ | 31. $8)\underline{854}$ |
| 5. $4)\underline{57}$ | 14. $6)\underline{79}$ | 23. $7)\underline{230}$ | 32. $8)\underline{963}$ |
| 6. $4)\underline{74}$ | 15. $6)\underline{87}$ | 24. $7)\underline{136}$ | 33. $9)\underline{200}$ |
| 7. $4)\underline{59}$ | 16. $6)\underline{92}$ | 25. $8)\underline{257}$ | 34. $9)\underline{309}$ |
| 8. $4)\underline{94}$ | 17. $6)\underline{89}$ | 26. $8)\underline{451}$ | 35. $9)\underline{491}$ |
| 9. $5)\underline{67}$ | 18. $6)\underline{94}$ | 27. $8)\underline{605}$ | 36. $9)\underline{118}$ |

262. Exercise.

1. When handkerchiefs are sold at 2 for 25 cents, how much are they apiece ?
2. If a turkey weighing 6 pounds sold for 75 cents, how much was that a pound ?
3. In 2 rods there are 33 feet ; how many feet are there in 1 rod ?
4. How much must be paid for a pint of varnish at 65 cents a quart ?
5. If 2 dressed hogs weigh 625 pounds, what is their average weight ?
6. What was the price paid per acre, if a lot of 7 acres cost \$825 ?
7. What was the average weight of 2 steers, if one weighed 875 pounds and the other 964 pounds ?
8. What is the average age of the five members of a graduating class, if their ages are 17 years, 16 years, 18 years, 15 years, and 15 years, respectively ?
9. A farmer paid a boy \$110 for 9 months' work ; what were the monthly wages paid ?
10. A lady paid 50 cents for 4 yards of velvet trimming ; how much was it a yard ?
11. Two cans of lard weighed 56 pounds apiece and a third can weighed 48 pounds ; what was their average weight ?

263. Divide 48 by 16.

$$16 \overline{) 48} \begin{array}{l} 3 \\ 48 \end{array}$$

$\frac{1}{16}$ of 48 = 3, since 16×3 , or $3 \times 16 = 48$.

264. Exercise.

Divide :

- | | | |
|---------------|----------------|----------------|
| 1. 22 by 11. | 18. 65 by 13. | 35. 651 by 93. |
| 2. 36 by 12. | 19. 54 by 18. | 36. 406 by 58. |
| 3. 28 by 14. | 20. 95 by 19. | 37. 384 by 48. |
| 4. 45 by 15. | 21. 100 by 50. | 38. 423 by 47. |
| 5. 60 by 15. | 22. 126 by 63. | 39. 308 by 44. |
| 6. 66 by 22. | 23. 108 by 36. | 40. 558 by 62. |
| 7. 60 by 20. | 24. 129 by 43. | 41. 305 by 61. |
| 8. 72 by 24. | 25. 124 by 31. | 42. 134 by 67. |
| 9. 81 by 27. | 26. 288 by 72. | 43. 102 by 34. |
| 10. 64 by 16. | 27. 324 by 81. | 44. 126 by 42. |
| 11. 72 by 18. | 28. 260 by 52. | 45. 171 by 57. |
| 12. 84 by 21. | 29. 470 by 94. | 46. 192 by 64. |
| 13. 92 by 23. | 30. 174 by 87. | 47. 207 by 69. |
| 14. 78 by 13. | 31. 184 by 92. | 48. 176 by 88. |
| 15. 90 by 18. | 32. 228 by 76. | 49. 300 by 75. |
| 16. 96 by 16. | 33. 318 by 53. | 50. 440 by 55. |
| 17. 91 by 13. | 34. 576 by 96. | 51. 140 by 28. |

265. Divide 795 by 15.

$15 \overline{) 795} \quad (53$

$\begin{array}{r} 75 \\ \underline{45} \\ 45 \\ \underline{} \end{array}$	$\frac{1}{15}$ of 79 is 5, the first figure of the quotient. Taking 15×5 , or 75, from 79, we have 4 remaining. Annexing 5, the next figure of the dividend, to the remainder, we have 45.
---	---

$\frac{1}{15}$ of 45 is 3, the second figure of the quotient.

Taking 15×3 , or 45, from 45, we have nothing remaining.

The quotient is 53.

266. Exercise.

Divide :

- | | | |
|---------------|-----------------|-----------------|
| 1. 143 by 11. | 10. 656 by 41. | 19. 3770 by 65. |
| 2. 276 by 12. | 11. 867 by 51. | 20. 4420 by 85. |
| 3. 429 by 13. | 12. 528 by 22. | 21. 1804 by 82. |
| 4. 602 by 14. | 13. 1664 by 26. | 22. 1932 by 21. |
| 5. 795 by 15. | 14. 2088 by 72. | 23. 1098 by 18. |
| 6. 294 by 21. | 15. 1092 by 42. | 24. 1736 by 28. |
| 7. 465 by 31. | 16. 1056 by 24. | 25. 3752 by 56. |
| 8. 782 by 23. | 17. 2024 by 44. | 26. 2538 by 54. |
| 9. 800 by 32. | 18. 2520 by 56. | 27. 1961 by 53. |

Measure :

- | | | |
|----------------|-----------------|-----------------|
| 28. 252 by 12. | 30. 684 by 38. | 32. 4000 by 32. |
| 29. 286 by 22. | 31. 1215 by 45. | 33. 3591 by 24. |

267. Exercise.

1. A man was paid a debt of \$125 in 25 bills of equal value ; what was the value of each bill ?

2. The population of Rahway, N. J., was 7105 in 1890 and 7935 in 1900 ; what was the average gain per year for the ten years ?

3. A teacher was employed at \$810 for 9 months, but he resigned at the end of 7 months ; how much had he earned ?

4. If a farm of 84 acres is valued at \$2100, what value is placed on each acre ?

5. What is the average number of miles that a train

must run per hour to reach a city 990 miles distant in 18 hours ?

6. A man's lot of 25 acres and 2 cows are valued at \$685 ; if the cows are valued at \$30 apiece, what value is placed on the land per acre ?

7. A man bought property valued at \$1872 ; how much must he pay a year, if he is given 12 years to pay for it and is to pay the same amount each year ?

8. If 12 acres of wheat yielded 336 bushels, how much should 25 acres yield at the same average ?

9. I bought 14 thousand feet of white pine boards for \$448 ; what did I pay per thousand feet ?

10. A drover bought 25 sheep for \$100 and sold them for \$150 ; what was the average gain per head ?

268. Exercise.

1. How many trips did a farmer make to haul away 900 bushels of wheat, if he hauled 75 bushels at a load ?

75) 900 (• 900 bushels was the amount hauled.
 75 bushels was the amount hauled at one load.

! 900 bu. : 75 bu. = $900 \div 75$, or • = the number of trips.

2. A clerk pays \$25 a month rent for a house valued at \$3750 ; in how many months will the rent amount to the value of the house ?

3. A dealer shipped 792 dozen eggs in crates holding 72 dozen each ; how many crates did he ship ?

4. How many feet are there in 1728 inches ?

5. There are 32 quarts in a bushel ; how many bushels are there in 608 quarts ?

6. How many cows at \$25 a head can be bought for \$320, and what amount will be over?

$\begin{array}{r} 25 \overline{) 320} \quad (12 \\ \underline{25} \\ 70 \\ \underline{50} \\ 20 \end{array}$	<p>\$320 is the amount to be spent.</p> <p>\$25 is the price paid for each cow.</p> <p>$\\$320 : \\$25 = 320 \div 25$, or 12, is the number that can be bought, with \$20 over.</p>
--	--

7. Corn weighs 56 pounds to the bushel. A farmer's crop when sold weighed 7125 pounds; how many bushels had he, and how many pounds over?

8. At 15 cents a yard, how many yards of flannel can be bought in exchange for 9 pounds of chickens at 10 cents a pound?

9. If the distance around a wheel is 12 feet, how many times will the wheel turn in going 5280 feet, or 1 mile?

269. Since $10 \times 4 = 40$, $40 \div 10 = 4$, or 4|0.

Since $100 \times 4 = 400$, $400 \div 100 = 4$, or 4|00.

Since $1000 \times 4 = 4000$, $4000 \div 1000 = 4$, or 4|000.

Therefore,

Cutting one cipher from the right of a number divides the number by 10, cutting two ciphers divides it by 100, three ciphers by 1000, and so on.

270. Oral Exercise.

Read, supplying the missing numbers:

- | | | |
|--------------------------|-----------------------------|------------------------------|
| 1. $30 \div 10 = \cdot$ | 6. $400 \div 100 = \cdot$ | 11. $7000 \div 1000 = \cdot$ |
| 2. $60 \div 10 = \cdot$ | 7. $200 \div 100 = \cdot$ | 12. $8000 \div 1000 = \cdot$ |
| 3. $90 \div 10 = \cdot$ | 8. $500 \div 100 = \cdot$ | 13. $9000 \div 1000 = \cdot$ |
| 4. $500 \div 10 = \cdot$ | 9. $4000 \div 100 = \cdot$ | 14. $5000 \div 1000 = \cdot$ |
| 5. $320 \div 10 = \cdot$ | 10. $3200 \div 100 = \cdot$ | 15. $8000 \div 1000 = \cdot$ |

271. $1200 \div 20 = 60$.

Also, $120|0 \div 6|0$, or $120 \div 2 = 60$.

Therefore,

Cutting off the same number of ciphers from the right of two numbers does not change their quotient.

272. Oral Exercise.

Read, supplying the missing numbers :

- | | | |
|--------------------------|--------------------------|------------------------------|
| 1. $40 \div 20 = \cdot$ | 5. $150 \div 30 = \cdot$ | 9. $3600 \div 400 = \cdot$ |
| 2. $80 \div 20 = \cdot$ | 6. $300 \div 50 = \cdot$ | 10. $7200 \div 600 = \cdot$ |
| 3. $90 \div 30 = \cdot$ | 7. $350 \div 70 = \cdot$ | 11. $8000 \div 4000 = \cdot$ |
| 4. $100 \div 20 = \cdot$ | 8. $630 \div 90 = \cdot$ | 12. $9000 \div 3000 = \cdot$ |

Forming, Reading, and Writing Numbers Above 10000; Fundamental Operations.

To the teacher. The study of numbers above 10000 may be deferred, if desirable, and taken up at the close of Chap. II or Chap. III.

273. Thousands are counted up to 999 thousand.

274. A thousand thousand is called a *million*.

Millions are counted up to 999 million.

275. A thousand million is called a *billion*.

Billions are counted up to 999 billion.

276. When more than three figures are used to write a whole number, they are separated by commas into groups, or Periods, of three figures each.

277. Counting from the right,

In the first period any number of units from 1 to 999 is found.

In the second period any number of thousands from 1 to 999 is found.

In the third period any number of millions from 1 to 999 is found.

In the fourth period any number of billions from 1 to 999 is found.

278. TABLE.

Hundred-billions.				Hundred-millions.				Hundred-thousands.				Hundreds.			
Ten-billions.				Ten-millions.				Ten-thousands.				Tens.			
Billions.				Millions.				Thousands.				Units.			
4	2	7		3	2	0		4	0	7		0	6	3	
}				}				}				}			
Billions.				Millions.				Thousands.				Units.			
4th period.				3d period.				2d period.				1st period.			

279. 427,320,407,063 is read *four hundred twenty-seven billion three hundred twenty million four hundred seven thousand sixty-three*.

280. To read a number,

1. *Beginning at the right, separate the number into periods of three figures each.*

2. *Beginning at the left, read the number in each period and give it the name of the period, except in units, where the name of the period is omitted.*

281. Oral Exercise.

Read :

- | | | |
|------------|--------------|----------------------|
| 1. 10,000. | 9. 300,000. | 17. 2,725,248. |
| 2. 20,000. | 10. 401,000. | 18. 46,701,000. |
| 3. 25,000. | 11. 520,000. | 19. 530,800,500. |
| 4. 38,000. | 12. 725,001. | 20. 2,486,430,002. |
| 5. 47,001. | 13. 706,020. | 21. 8,000,700,049. |
| 6. 48,026. | 14. 804,802. | 22. 3,007,428,304. |
| 7. 74,800. | 15. 900,027. | 23. 48,006,928,040. |
| 8. 59,704. | 16. 450,006. | 24. 867,049,302,742. |

282. Exercise.

Write in words :

- | | | |
|-------------|-----------------|----------------------|
| 1. 60,000. | 6. 2,425,070. | 11. 200,000,000. |
| 2. 22,700. | 7. 5,000,607. | 12. 607,007,009. |
| 3. 48,001. | 8. 16,742,003. | 13. 4,863,002,140. |
| 4. 760,040. | 9. 24,683,214. | 14. 25,600,750,689. |
| 5. 400,797. | 10. 10,020,040. | 15. 440,700,632,156. |

283. Oral Exercise.

What number is :

- 1 greater than 9,999 ? 1 less than 10,000 ?
- 1 greater than 59,999 ? 1 less than 40,000 ?
- 1 greater than 599,999 ? 1 less than 200,000 ?
- 1 greater than 999,999 ? 1 less than 4,000,000 ?
- In 427,635 there are how many thousands ? how many units ?
- In 50,700,040 there are how many millions ? how many thousands ? how many units ?
- What is the largest number that can be written with six figures ? the smallest ?

284. Exercise.

Write in figures :

1. Ten thousand one hundred.
2. Fourteen thousand two hundred six.
3. Twenty thousand seven hundred twenty.
4. Fifty thousand forty-four.
5. Ninety-six thousand four hundred forty-four.
6. One hundred thousand one.
7. One hundred thousand one hundred.
8. Two hundred thousand forty-eight.
9. Four hundred eight thousand eighty.
10. Five hundred thousand six hundred thirty-four.
11. Nine million seventy thousand six hundred fifty.
12. Twenty-six million eight hundred thousand fifty-six.
13. Five hundred twenty million seventy-five thousand fourteen.
14. Eight hundred million nine thousand five hundred six.
15. Two hundred twenty million six hundred twenty-five thousand.
16. One billion one hundred million.
17. Six billion six million six hundred thousand four.
18. Seventy billion sixty-five thousand nineteen.
19. Nineteen hundred five.
20. Eighteen hundred sixty-five.
21. Fourteen hundred ninety-two.
22. Seventeen hundred seventy-six.
23. One hundred seventy-five billion three hundred forty-eight million three hundred fourteen thousand two hundred seventy-seven.

285. Oral Exercise.

1. What is the largest number that can be written with nine figures ? the smallest ?
2. In 7,777,777 what does each 7 represent ?
3. Read 2,400 as hundreds ; as tens.
4. Read 1,200,000 as thousands ; as hundreds ; as tens.
5. Give the name of the fourth period ; the first ; the third ; the second.
6. Give the number of the period in which ten-millions are found ; hundred-thousands ; hundreds.
7. How many ciphers are required to write one thousand ? one million ? one hundred thousand ? one billion ? ten thousand ? ten million ?

286. Exercise.

Add :

1. 2,991	2. 1,376	3. 37,718
1,208	3,259	38,316
3,927	13,185	39,385
5,954	2,584	36,425
2,104	891	32,033
1,014	5,115	34,871
2,742	11,606	28,646
1,631	1,773	35,637
2,880	2,585	35,393
<u>5,646</u>	<u>2,403</u>	<u>33,220</u>

4.	\$8.92	7.	12	10.	\$89,220,558.49
	8.70		196,952		24,322,375.00
	7.62		323,485		4,271,562.00
	7.81		178,733		568,664.00
	7.89		1,227		2,615,202.88
	9.31		306,428		3,041,934.00
	8.65		291,445		47,722.00
	8.35		45,759		13,468,852.32
	7.54		135,104		6,909,608.31
	7.32		425,102		195.41
5.	\$18.56	8.	424,228	11.	\$ 402,515.47
	18.19		15,474,447		154,093.73
	13.76		4,799,742		3,785,926.74
	19.72		6,891,601		975,429.33
	17.70		50,711		3,062,808.61
	15.75		5,015,965		611,534.09
	13.53		1,599,374		601,806.54
	14.31		3,617,497		70,235.22
	11.38		547,641		54,029,115.36
	11.72		1,478,018		25,178,552.61
6.	\$916.67	9.	584,120	12.	\$ 792,657.23
	625.00		15,122,948		2,859,789.02
	458.33		457,106,995		964,528.68
	291.67		263,457,239		8,035,946.35
	250.00		26,493,855		76,730.18
	208.33		535,872,240		38,694,831.27
	166.67		244,909,123		5,618,659.50
	150.00		159,311,527		157,927.87
	150.00		39,251,413		22,073,559.51
	150.00		99,586,188		1,092,016.89

138 WHOLE NUMBERS AND FRACTIONAL PARTS.

13. From	62,727	16.	1,299,090	19.	29,387.06
take	<u>24,536</u>		<u>1,159,777</u>		<u>4,097.65</u>

14. From	13,900	17.	162,685.27	20.	6,415,000.00
take	<u>12,880</u>		<u>64,059.85</u>		<u>6,075.35</u>

15. From	4,221,085	18.	2,932,988.69	21.	1,222,117.55
take	<u>488,086</u>		<u>9,879.79</u>		<u>1,071,828.75</u>

287. Exercise.

Multiply :

1. 170	6. 5,714	11. 43,982.58	16. 719,258
<u>18</u>	<u>8,601</u>	<u>.94</u>	<u>1,328</u>

2. 4,018	7. 71,015	12. 25,953.86	17. \$150.78
<u>1,541</u>	<u>55,602</u>	<u>800</u>	<u>550</u>

3. 1,742	8. 807,017	13. 499,297	18. \$47.23
<u>121</u>	<u>6,951</u>	<u>4,513</u>	<u>7,230</u>

4. \$1.56	9. \$50.41	14. \$131.25	19. \$409.46
<u>30</u>	<u>750</u>	<u>25</u>	<u>62</u>

5. 8,781	10. 2,301	15. 1,920,248	20. 9,046,945
<u>8,107</u>	<u>74,000</u>	<u>7,564</u>	<u>28,931</u>

288. Exercise.

Divide :

1. 5405 by 23.
2. \$29.76 by 8.
3. \$15.12 by 42.
4. 42,804 by 123.
5. \$1,045.80 by 84.
6. \$599.36 by 32.
7. 135,564 by 316.
8. \$9,869.04 by 54.
9. 18,972 by 204.
10. 62,628 by 307.
11. 61,306 by 302.
12. \$9,789.00 by 325.
13. \$6,542.82 by 326.
14. \$65,700.50 by 202.
15. 2,428,040 by 808.
16. 1,522,756 by 1,234.

Measure :

17. 15,260 by 35.
18. \$80.64 by \$3.36.
19. 304,992 by 72.
20. \$1,638.00 by \$3.25.
21. 165,816 by 329.
22. \$224.20 by \$5.90.
23. \$2,058.75 by \$3.05.
24. \$180.72 by \$15.06.
25. \$800.80 by \$20.02.
26. \$145.44 by \$16.16.
27. \$4,152 by \$10.38.
28. \$6,586.24 by \$20.08.
29. \$26,274.78 by \$324.38.
30. \$28,809 by \$800.25.
31. \$28,317.63 by \$325.49.
32. \$180,443.76 by \$678.36.

289. Exercise.

1. A laborer had \$125.75 in a savings bank and drew out \$9.75 each week for 12 weeks ; how much had he left in this bank ?

2. In the LVIIIth Congress there were 208 Republicans in the House of Representatives and 178 Democrats ; how many were there of both ? How many more Republicans than Democrats ?

3. At the beginning of a trip a trolley car register showed that 6107 fares had been collected, and at the end

of the trip that 6298 had been collected ; how many fares were collected during the trip ?

4. A farmer bought a stove for \$25.75. He gave in payment his old stove weighing 286 pounds, for which he was paid \$0.01 a pound, and the balance in cash ; how much cash did he pay ?

5. The following table shows the amount and the cost of coffee imported to the United States for 11 months of a certain year. Read the table and find the totals :

Imported From	Pounds.	Cost.
Central America.....	43,286,988	\$4,587,409
Mexico....	29,298,733	2,665,725
West Indies.....	19,348,490	1,356,436
South America.....	57,255,375	4,132,132
Brazil.....	695,972,331	43,439,470
Europe.....	3,746,170	441,224
East Indies.....	18,710,738	2,081,120
Asia and Islands.....	4,489,184	556,199
Africa, etc.....	383,428	52,897
Totals.....		

6. The distance from New York to San Francisco is 3250 miles and the distance from San Francisco to Manila is 6789 miles ; what is the distance from New York to Manila by way of San Francisco ?

7. How many \$100-bills would make a million dollars ?

8. A farmer's tobacco crop consists of 1426 pounds of wrappers and 720 pounds of fillers. He has two offers for it : the first, 12 cents a pound for wrappers and 2 cents a pound for fillers ; the second, 9 cents a pound for all. Which is the better offer, and by how much ?

9. Find the sum of all numbers greater than 9996 and less than 10005.

10. How many times is a million contained in a billion ?

11. What must a man's income be per year in order that his income in 40 years shall amount to a million dollars ?

12. If a boy saves 5 cents a day from the age of 10 years to the age of 21 years, how much does he save in all, counting 365 days to a year ?

13. Find the increase in population from 1890 to 1900 for each of the ten largest cities in the United States, as follows :

Cities.	Population.		Increase.
	1900.	1890.	
New York, N. Y.....	3,437,202	2,492,591	
Chicago, Ill.....	1,698,575	1,099,850	
Philadelphia, Penn....	1,293,697	1,046,964	
St. Louis, Mo.....	575,238	451,770	
Boston, Mass.....	560,892	448,477	
Baltimore, Md.....	508,957	434,439	
Cleveland, Ohio.....	381,768	261,353	
Buffalo, N. Y.....	352,387	255,664	
San Francisco, Cal.....	342,782	298,997	
Cincinnati, Ohio.....	325,902	296,908	

Factors.

290. Exercise.

1. What two numbers multiplied together will produce 4 ? 6 ? 5 ? 9 ? 10 ? 15 ?

2. What three numbers multiplied together will produce 8 ? 12 ? 28 ? 30 ? 42 ?

The numbers which, when multiplied together, will produce a given number are the **Factors** of the number.

3. Name two factors that will produce 14 ; 22 ; 33 ; 35 ; 64 ; 72 ; 28 ; 84 ; 96.

4. What three factors will produce 45 ?

$45 = 5 \times 9 = 5 \times 3 \times 3$. Therefore, the three factors of 45 are 5, 3, and 3.

5. What three factors will produce 18 ? 24 ? 28 ? 30 ? 36 ? 40 ?

6. What are the two factors of 5 ? 7 ? 11 ? 13 ?

A number that has no other factors than *itself* and *one* is a **Prime Number**.

7. Tell which of the following numbers are prime :

2	5	8	11	14	17	21
3	6	9	12	15	18	23
4	7	10	13	16	20	25

When all the factors of a number are prime numbers, they are called the **Prime Factors** of the number.

8. Find the prime factors of 36.

$36 = 4 \times 9 = 2 \times 2 \times 3 \times 3$. Therefore, the prime factors of 36 are 2, 2, 3, and 3.

Find the prime factors of :

9. 15.	13. 60.	17. 24.	21. 40.	25. 16.
10. 30.	14. 72.	18. 35.	22. 56.	26. 28.
11. 36.	15. 96.	19. 25.	23. 64.	27. 45.
12. 48.	16. 27.	20. 32.	24. 84.	28. 63.

Divisors.

291. Exercise.

1. Name a number that will divide 4 without a remainder. Name a number that will divide 9 without a remainder.

A number that will divide a given number without a remainder is called an **Exact Divisor** of the number.

2. Name two exact divisors of 6 ; 8 ; 10 ; 14 ; 15 ; 21 ; 27 ; 35.

3. Name three exact divisors of 12 ; 16 ; 18 ; 20 ; 24 ; 30 ; 32 ; 36.

4. Name an exact divisor of both 6 and 9 ; 8 and 12 ; 10 and 15.

An exact divisor of each of two or more numbers is called a **Common Divisor** of these numbers.

5. Name a common divisor of 6 and 8 ; 10 and 15 ; 14 and 21.

6. Name two common divisors of 8 and 12 ; 9 and 18 ; 16 and 20.

7. Name three common divisors of 12 and 18 ; 30 and 42.

Name the greatest common divisor of :

- | | | |
|----------------|----------------|----------------|
| 8. 20 and 30. | 11. 36 and 48. | 14. 18 and 24. |
| 9. 24 and 36. | 12. 21 and 28. | 15. 16 and 24. |
| 10. 30 and 45. | 13. 36 and 45. | 16. 24 and 32. |

CHAPTER II.

FRACTIONS.

Introductory Problems and Definitions.

292. Oral Exercise.

1. Line AB is divided into
how many equal parts ?



2. What is each part called ?

3. How many halves are there in 1 ?

4. CD is divided into how
many equal parts ?



5. What is each part called ?

6. What are 2 parts called ?

7. What are 3 parts called ? 4 parts ?

8. How many fourths are there in 1 ?

9. EF is divided into how
many equal parts ?



10. What is each part called ?

11. What are 2 parts called ? 3 parts ? 4 parts ? 6
parts ?

12. How many eighths are there in 1 ?

13. How many halves are there in 2 ? How many
fourths ?

14. How many fourths are there in $\frac{1}{2}$? How many
eighths ?

15. How many halves are there in $1\frac{1}{2}$? How many fourths?

16. What is $\frac{1}{2}$ of $\frac{1}{2}$? $\frac{1}{2}$ of $\frac{1}{4}$?

17. How many eighths are there in $\frac{1}{4}$? in $\frac{1}{2}$? in $\frac{3}{4}$?

Read, supplying the missing numbers :

- | | | | |
|-------------------------------------|--------------------------------------|--------------------------------------|--|
| 18. $1 = \frac{\cdot}{\cdot}$ | 24. $\frac{2}{4} = \frac{\cdot}{8}$ | 30. $2 = \frac{\cdot}{4}$ | 36. $\frac{2}{4} = \frac{\cdot}{\cdot}$ |
| 19. $1 = \frac{\cdot}{4}$ | 25. $\frac{3}{4} = \frac{\cdot}{8}$ | 31. $2\frac{1}{4} = \frac{\cdot}{4}$ | 37. $\frac{8}{4} = \frac{\cdot}{\cdot}$ |
| 20. $\frac{1}{2} = \frac{\cdot}{4}$ | 26. $2 = \frac{\cdot}{2}$ | 32. $\frac{6}{8} = \frac{\cdot}{4}$ | 38. $\frac{3}{2} = \frac{\cdot}{4}$ |
| 21. $1 = \frac{\cdot}{8}$ | 27. $1\frac{1}{2} = \frac{\cdot}{2}$ | 33. $\frac{8}{8} = \frac{\cdot}{4}$ | 39. $\frac{1}{2}$ of $\frac{1}{2} = \cdot$ |
| 22. $\frac{1}{2} = \frac{\cdot}{8}$ | 28. $1\frac{1}{4} = \frac{\cdot}{4}$ | 34. $\frac{2}{8} = \frac{\cdot}{4}$ | 40. $\frac{1}{2}$ of $\frac{1}{4} = \cdot$ |
| 23. $\frac{1}{4} = \frac{\cdot}{8}$ | 29. $1\frac{3}{4} = \frac{\cdot}{4}$ | 35. $\frac{4}{4} = \frac{\cdot}{2}$ | 41. $\frac{1}{4}$ of $\frac{1}{2} = \cdot$ |

293. Oral Exercise.

1. Line MN is divided into how many equal parts?



2. What is each part called?

3. What are 2 parts called? 3 parts?

4. How many thirds are there in 1?

5. PQ is divided into how many equal parts?

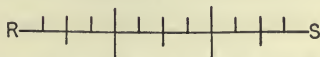


6. What is each part called?

7. What are 2 parts called? 3 parts? 6 parts?

8. How many sixths are there in 1?

9. RS is divided into how many equal parts?



10. What is each part called? What are 2 parts called? 12 parts? 3 parts?

11. How many thirds are there in 2? How many sixths?

12. What is $\frac{1}{2}$ of $\frac{1}{3}$? $\frac{1}{2}$ of $\frac{1}{6}$?

13. How many sixths are there in $\frac{1}{3}$? How many twelfths?

14. How many sixths are there in $\frac{2}{3}$? How many twelfths?

15. How many sixths are there in $\frac{1}{2}$? How many twelfths?

16. How many thirds are there in $1\frac{1}{3}$? How many sixths?

17. How many thirds are there in $1\frac{2}{3}$? How many sixths?

18. How many twelfths are there in $\frac{1}{2}$? in $\frac{1}{4}$?

Read, supplying the missing numbers :

- | | | | |
|--------------------------------------|---------------------------------------|--|--|
| 19. $1 = \frac{\cdot}{6}$ | 27. $1\frac{1}{3} = \frac{\cdot}{3}$ | 35. $2 = \frac{\cdot}{3}$ | 43. $1\frac{1}{6} = \frac{\cdot}{6}$ |
| 20. $1 = \frac{\cdot}{6}$ | 28. $1\frac{2}{3} = \frac{\cdot}{3}$ | 36. $2\frac{1}{3} = \frac{\cdot}{3}$ | 44. $1\frac{5}{6} = \frac{\cdot}{3}$ |
| 21. $1 = \frac{\cdot}{12}$ | 29. $1\frac{1}{3} = \frac{\cdot}{12}$ | 37. $2\frac{1}{6} = \frac{\cdot}{6}$ | 45. $1\frac{2}{6} = \frac{\cdot}{6}$ |
| 22. $\frac{1}{3} = \frac{\cdot}{6}$ | 30. $1\frac{2}{3} = \frac{\cdot}{12}$ | 38. $3 = \frac{\cdot}{3}$ | 46. $\frac{9}{6} = \frac{\cdot}{3}$ |
| 23. $\frac{2}{3} = \frac{\cdot}{6}$ | 31. $\frac{8}{12} = \frac{\cdot}{6}$ | 39. $2 = \frac{\cdot}{6}$ | 47. $\frac{1}{2} = \frac{\cdot}{6}$ |
| 24. $\frac{1}{3} = \frac{\cdot}{12}$ | 32. $\frac{2}{6} = \frac{\cdot}{3}$ | 40. $\frac{1}{2}$ of $\frac{1}{3} = \circ$ | 48. $\frac{1}{2} = \frac{\cdot}{12}$ |
| 25. $\frac{2}{3} = \frac{\cdot}{12}$ | 33. $\frac{4}{12} = \frac{\cdot}{3}$ | 41. $\frac{1}{2}$ of $\frac{1}{6} = \cdot$ | 49. $\frac{6}{6} = \frac{\cdot}{3}$ |
| 26. $\frac{5}{6} = \frac{\cdot}{12}$ | 34. $1\frac{2}{3} = \frac{\cdot}{6}$ | 42. $1\frac{2}{3} = \frac{\cdot}{3}$ | 50. $1\frac{10}{12} = \frac{\cdot}{6}$ |

294. One of the equal parts into which a unit is divided is a **Fractional Unit**.

Thus, $\frac{1}{2}$, $\frac{1}{3}$, $\frac{1}{4}$, $\frac{1}{6}$, $\frac{1}{12}$ are fractional units.

295. A number made up of like fractional units is a **Fraction**.

Thus, $\frac{2}{3}$, $\frac{3}{2}$, $\frac{3}{4}$, $\frac{1}{6}$, $\frac{1}{8}$ are fractions.

296. When a fraction is written in figures, the number below the line is called the **Denominator** and the number above the line the **Numerator**. The numerator and denominator together are called the **Terms** of the fraction.

Thus, in the fraction $\frac{4}{5}$, 5 is the denominator, 4 the numerator, and 4 and 5 together are the terms.

297. A **Proper Fraction** is a fraction whose numerator is less than its denominator ; as, $\frac{3}{4}$.

298. An **Improper Fraction** is a fraction whose numerator is equal to or greater than its denominator ; as, $\frac{4}{4}$ and $\frac{7}{4}$.

299. An **Integer** is a whole number ; as, 7.

300. A **Mixed Number** is a number made up of an integer and a fraction ; as, $2\frac{3}{4}$.

Reduction.

301.



Here we see that

$$\frac{3}{4} = \frac{6}{8} = \frac{2 \times 3}{2 \times 4} ; \text{ and } \frac{6}{8} = \frac{3}{4} = \frac{6 \div 2}{8 \div 2}.$$

Therefore,

Multiplying or dividing both terms of a fraction by the same number does not change its value.

302. Oral Exercise.

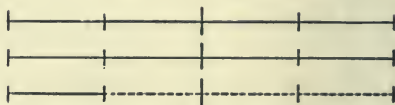
Read, supplying the missing numbers :

- | | | | |
|-------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|
| 1. $\frac{1}{2} = \frac{\cdot}{4}$ | 7. $\frac{3}{6} = \frac{\cdot}{20}$ | 13. $\frac{6}{8} = \frac{\cdot}{4}$ | 19. $\frac{15}{20} = \frac{\cdot}{5}$ |
| 2. $\frac{2}{3} = \frac{\cdot}{6}$ | 8. $\frac{5}{4} = \frac{\cdot}{16}$ | 14. $\frac{2}{4} = \frac{\cdot}{2}$ | 20. $\frac{20}{25} = \frac{\cdot}{5}$ |
| 3. $\frac{3}{4} = \frac{\cdot}{8}$ | 9. $\frac{3}{8} = \frac{\cdot}{40}$ | 15. $\frac{6}{4} = \frac{\cdot}{2}$ | 21. $\frac{18}{12} = \frac{\cdot}{2}$ |
| 4. $\frac{4}{5} = \frac{\cdot}{9}$ | 10. $\frac{2}{3} = \frac{\cdot}{9}$ | 16. $\frac{10}{6} = \frac{\cdot}{3}$ | 22. $\frac{12}{10} = \frac{\cdot}{5}$ |
| 5. $\frac{4}{6} = \frac{\cdot}{15}$ | 11. $\frac{3}{6} = \frac{\cdot}{25}$ | 17. $\frac{12}{16} = \frac{\cdot}{4}$ | 23. $\frac{15}{18} = \frac{\cdot}{6}$ |
| 6. $\frac{5}{6} = \frac{\cdot}{24}$ | 12. $\frac{2}{15} = \frac{\cdot}{30}$ | 18. $\frac{14}{16} = \frac{\cdot}{8}$ | 24. $\frac{24}{30} = \frac{\cdot}{5}$ |

303. Exercise.

Show that :

- 1.
- $2\frac{1}{4} = \frac{9}{4}$
- . Thus,



- | | | | |
|------------------------|-----------------------------------|------------------------------------|------------------------------------|
| 2. $2 = \frac{4}{2}$. | 4. $2\frac{1}{2} = \frac{5}{2}$. | 6. $2\frac{3}{4} = \frac{11}{4}$. | 8. $3\frac{2}{3} = \frac{11}{3}$. |
| 3. $3 = \frac{9}{3}$. | 5. $2\frac{1}{3} = \frac{7}{3}$. | 7. $2\frac{4}{6} = \frac{14}{6}$. | 9. $3\frac{2}{5} = \frac{17}{5}$. |

304. Changing the form of a number without changing its value is called **Reduction**.

305. Reduce $2\frac{2}{3}$ to thirds.

Since 1 equals 3 thirds, 2 equals 2 times 3 thirds, or 6 thirds, and $2\frac{2}{3}$ equals 6 thirds plus 2 thirds, or 8 thirds.

306. Reducing 2 to $\frac{6}{3}$, or $2\frac{2}{3}$ to $\frac{8}{3}$ is *reducing a whole or a mixed number to an improper fraction*.

307. Oral Exercise.

Reduce :

- | | | |
|-----------------|-----------------|-----------------|
| 1. 2 to halves. | 3. 4 to halves. | 5. 2 to fifths. |
| 2. 4 to thirds. | 4. 3 to halves. | 6. 5 to thirds. |

Reduce to improper fractions :

- | | | | |
|---------------------|----------------------|----------------------|-----------------------|
| 7. $2\frac{1}{4}$. | 10. $8\frac{3}{4}$. | 13. $7\frac{1}{2}$. | 16. $4\frac{5}{8}$. |
| 8. $3\frac{3}{4}$. | 11. $3\frac{1}{2}$. | 14. $6\frac{1}{4}$. | 17. $12\frac{1}{2}$. |
| 9. $2\frac{2}{5}$. | 12. $3\frac{3}{8}$. | 15. $4\frac{1}{6}$. | 18. $13\frac{1}{3}$. |

308. Reduce $12\frac{4}{5}$ to fifths.

$$1 = \frac{5}{5}.$$

$$12 = 12 \times \frac{5}{5}, \text{ or } \frac{60}{5}.$$

$$12\frac{4}{5} = \frac{60}{5} + \frac{4}{5}, \text{ or } \frac{64}{5}.$$

309. Exercise.

Reduce to improper fractions :

- | | | | |
|----------------------|-----------------------|-----------------------|------------------------|
| 1. $13\frac{1}{3}$. | 8. $66\frac{2}{3}$. | 15. $18\frac{7}{8}$. | 22. $112\frac{1}{2}$. |
| 2. $18\frac{3}{4}$. | 9. $42\frac{6}{7}$. | 16. $55\frac{5}{9}$. | 23. $118\frac{3}{4}$. |
| 3. $16\frac{2}{3}$. | 10. $20\frac{2}{3}$. | 17. $36\frac{2}{5}$. | 24. $300\frac{4}{5}$. |
| 4. $14\frac{2}{7}$. | 11. $44\frac{4}{9}$. | 18. $16\frac{5}{6}$. | 25. $299\frac{1}{9}$. |
| 5. $37\frac{1}{2}$. | 12. $30\frac{1}{4}$. | 19. $33\frac{1}{3}$. | 26. $187\frac{3}{4}$. |
| 6. $62\frac{1}{2}$. | 13. $48\frac{4}{5}$. | 20. $14\frac{1}{2}$. | 27. $575\frac{4}{5}$. |
| 7. $87\frac{1}{2}$. | 14. $26\frac{2}{3}$. | 21. $67\frac{1}{2}$. | 28. $627\frac{7}{8}$. |

310. Exercise.

Show that :

1. $\frac{7}{3} = 2\frac{1}{3}$. Thus, $\underbrace{\frac{1}{3} + \frac{1}{3} + \frac{1}{3}}_1 + \underbrace{\frac{1}{3} + \frac{1}{3} + \frac{1}{3}}_1 + \frac{1}{3}$
2. $\frac{4}{2} = 2$. 4. $\frac{7}{4} = 1\frac{3}{4}$. 6. $\frac{10}{3} = 3\frac{1}{3}$. 8. $\frac{12}{5} = 2\frac{2}{5}$.
3. $\frac{7}{2} = 3\frac{1}{2}$. 5. $\frac{11}{4} = 2\frac{3}{4}$. 7. $\frac{14}{3} = 4\frac{2}{3}$. 9. $9\frac{2}{5} = 14\frac{4}{5}$.

311. Changing $\frac{4}{2}$ to 2, or $\frac{7}{2}$ to $3\frac{1}{2}$, is *reducing an improper fraction to a whole or mixed number*.



Here we see that $\frac{2}{3} = \frac{1}{3}$ of 2, or $2 \div 3$. Hence,

A fraction may be considered to denote that the numerator is to be divided by the denominator.

313. Oral Exercise.

Reduce to a whole or mixed number :

1. $\frac{7}{3}$. Thus, $\frac{7}{3}$ equals $\frac{1}{3}$ of 7, or $2\frac{1}{3}$.
 2. $\frac{8}{2}$. 4. $\frac{9}{4}$. 6. $\frac{14}{4}$. 8. $\frac{25}{6}$. 10. $\frac{32}{6}$. 12. $\frac{21}{4}$.
 3. $\frac{9}{3}$. 5. $\frac{18}{6}$. 7. $\frac{20}{6}$. 9. $\frac{15}{4}$. 11. $\frac{17}{3}$. 13. $\frac{40}{9}$.

314. A fraction is in its *lowest terms* when its numerator and denominator have no common divisor.

Thus, $\frac{3}{4}$ is in its lowest terms, since 3 and 4 have no common divisor.

315. Reduce $\frac{40}{60}$ to lowest terms :

$$\frac{40}{60} = \frac{4}{6} = \frac{2}{3}.$$

Therefore, to reduce a fraction to its lowest terms,

Divide out of both terms all common divisors of them ; or,

Divide both terms by their greatest common divisor.

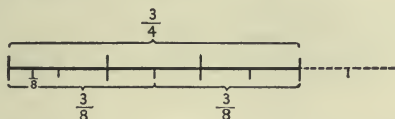
316. Oral Exercise.

Reduce to lowest terms :

1. $\frac{8}{12}$. 5. $\frac{9}{12}$. 9. $\frac{25}{76}$. 13. $\frac{18}{64}$. 17. $\frac{81}{90}$.
 2. $\frac{16}{20}$. 6. $\frac{24}{32}$. 10. $\frac{42}{64}$. 14. $\frac{36}{48}$. 18. $\frac{36}{24}$.
 3. $\frac{25}{30}$. 7. $\frac{48}{60}$. 11. $\frac{28}{42}$. 15. $\frac{22}{33}$. 19. $\frac{48}{40}$.
 4. $\frac{18}{24}$. 8. $\frac{60}{80}$. 12. $\frac{32}{64}$. 16. $\frac{32}{48}$. 20. $\frac{50}{100}$.

Multiplication and Division.

317.



Here we see that

$$2 \times \frac{3}{8} = \frac{6}{8} = \frac{2 \times 3}{8}; \text{ or, } 2 \times \frac{3}{8} = \frac{3}{4} = \frac{3}{8 \div 2}.$$

Therefore,

To multiply a fraction by a whole number, multiply the numerator or divide the denominator by the whole number.

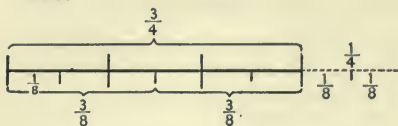
NOTE. Divide the denominator when possible.

318. Oral Exercise.

Read, supplying the missing numbers :

- | | |
|----------------------------------|----------------------------------|
| 1. $2 \times \frac{2}{5} = .$ | 13. $4 \times \frac{1}{12} = .$ |
| 2. $2 \times \frac{1}{6} = .$ | 14. $3 \times \frac{2}{3} = .$ |
| 3. $3 \times \frac{3}{6} = .$ | 15. $3 \times \frac{2}{9} = .$ |
| 4. $2 \times 2\frac{1}{3} = .$ | 16. $4 \times 2\frac{1}{7} = .$ |
| 5. $2 \times 4\frac{1}{4} = .$ | 17. $5 \times 5\frac{2}{5} = .$ |
| 6. $3 \times 9\frac{1}{9} = .$ | 18. $5 \times 3\frac{1}{10} = .$ |
| 7. $2 \times \frac{3}{8} = .$ | 19. $6 \times \frac{1}{6} = .$ |
| 8. $3 \times \frac{2}{7} = .$ | 20. $3 \times \frac{4}{9} = .$ |
| 9. $5 \times \frac{3}{10} = .$ | 21. $2 \times \frac{5}{4} = .$ |
| 10. $2 \times 5\frac{3}{10} = .$ | 22. $6 \times 1\frac{1}{12} = .$ |
| 11. $3 \times 3\frac{1}{9} = .$ | 23. $4 \times 3\frac{2}{9} = .$ |
| 12. $4 \times 5\frac{2}{12} = .$ | 24. $4 \times 7\frac{1}{8} = .$ |

319.



Here we see that

$$\frac{6}{8} \div 2 = \frac{3}{8} = \frac{6 \div 2}{8}; \text{ or, } \frac{3}{4} \div 2 = \frac{3}{8} = \frac{3}{2 \times 4}.$$

Therefore,

To divide a fraction by a whole number, divide the numerator or multiply the denominator by the whole number.

NOTE. Divide the numerator when possible.

320. Oral Exercise.

Read, supplying the missing numbers:

- | | | |
|------------------------------|---|---|
| 1. $\frac{4}{6} \div 2 = .$ | 9. $\frac{3}{10} \div 10 = .$ | 17. $\frac{1}{6}$ of $5\frac{1}{2} = .$ |
| 2. $\frac{2}{6} \div 3 = .$ | 10. $\frac{4}{5} \div 5 = .$ | 18. $\frac{1}{4}$ of $16\frac{1}{5} = .$ |
| 3. $\frac{6}{9} \div 3 = .$ | 11. $10\frac{2}{3} \div 5 = .$ | 19. $\frac{1}{3}$ of $\frac{2}{7} = .$ |
| 4. $\frac{7}{2} \div 4 = .$ | 12. $12\frac{6}{7} \div 3 = .$ | 20. $\frac{1}{4}$ of $\frac{8}{9} = .$ |
| 5. $4\frac{4}{6} \div 2 = .$ | 13. $\frac{1}{2}$ of $\frac{6}{6} = .$ | 21. $\frac{1}{7}$ of $\frac{3}{2} = .$ |
| 6. $6\frac{2}{3} \div 3 = .$ | 14. $\frac{1}{2}$ of $\frac{3}{5} = .$ | 22. $\frac{1}{8}$ of $\frac{1}{2} = .$ |
| 7. $\frac{2}{3} \div 3 = .$ | 15. $\frac{1}{3}$ of $\frac{9}{4} = .$ | 23. $\frac{1}{6}$ of $18\frac{1}{3} = .$ |
| 8. $\frac{9}{20} \div 5 = .$ | 16. $\frac{1}{5}$ of $1\frac{0}{5} = .$ | 24. $\frac{1}{5}$ of $10\frac{1}{10} = .$ |

NOTE. $\frac{4}{6} \div 2$ and $\frac{1}{2}$ of $\frac{4}{6}$ have the same meaning.

321. Oral Exercise—Miscellaneous Problems.

1. Name at sight the whole or mixed number equivalent to each of the following:

$$\frac{3}{3}; \frac{5}{2}; \frac{15}{4}; \frac{25}{3}; \frac{11}{6}; \frac{26}{3}; \frac{18}{6}.$$

2. What part of a quart is a pint ?
3. A half peck is how many quarts ?
4. How many quarter pecks are there in a half peck ?
5. How many quarts are there in 3 pints ?
6. $\frac{3}{4}$ of a foot is how many inches ?
7. How many half inches are there in a foot ?
8. How many half feet are there in a yard ?
9. What part of a dime is 1 cent ?
10. A woman used half a gallon of milk for breakfast and one fourth of a gallon for dinner ; how many quarts did she use for both meals ?
11. What will $\frac{3}{4}$ of a pound of dried beef cost at 32 ct. per pound ?
12. If 4 pounds of coffee cost $\$4\frac{1}{5}$, what part of a dollar did 1 pound cost ? How many cents ?
13. If 3 pen trays cost $\$1\frac{4}{5}$, what part of a dollar did one cost ? How many cents ?
14. How many yards of ribbon are needed to make 5 bows, each $\frac{3}{4}$ of a yard long ?
15. A boy has four $2\frac{1}{2}$ -dollar gold pieces ; how much money has he ?
16. If a \$5-bill is exchanged for half dollars, how many should be received ?
17. A rod contains $5\frac{1}{2}$ yards ; how many yards are there in 2 rods ?
18. How many yards are there in 3 rods ?

Reduction.

322. Reduce $\frac{2}{3}$, $\frac{3}{4}$, and $\frac{5}{6}$ to 12ths.

$$12 = 4 \times 3, 3 \times 4, \text{ or } 2 \times 6.$$

$$\frac{2}{3} = \frac{4 \times 2}{4 \times 3} = \frac{8}{12}.$$

$$\frac{3}{4} = \frac{3 \times 3}{3 \times 4} = \frac{9}{12}.$$

$$\frac{5}{6} = \frac{2 \times 5}{2 \times 6} = \frac{10}{12}.$$

323. Fractions that have the same number for a denominator are said to have a **Common Denominator**.

324. Reducing $\frac{2}{3}$, $\frac{3}{4}$, and $\frac{5}{6}$ to 12ths is *reducing fractions to a common denominator*.

325. Fractions that have a common denominator are called **Similar Fractions**.

Thus, $\frac{8}{12}$, $\frac{9}{12}$, and $\frac{10}{12}$, having a common denominator, are similar fractions.

326. Exercise.

Reduce :

- | | |
|---|---|
| 1. $\frac{3}{5}$ and $\frac{2}{3}$ to 15ths. | 7. $\frac{2}{3}$, $\frac{3}{4}$, and $\frac{1}{2}$ to 12ths. |
| 2. $\frac{4}{5}$ and $\frac{3}{4}$ to 20ths. | 8. $\frac{4}{5}$, $\frac{2}{3}$, and $\frac{9}{10}$ to 30ths. |
| 3. $\frac{1}{2}$ and $\frac{3}{4}$ to 8ths. | 9. $\frac{1}{2}$, $\frac{3}{4}$, and $\frac{5}{6}$ to 20ths. |
| 4. $\frac{5}{9}$ and $\frac{5}{6}$ to 18ths. | 10. $\frac{2}{3}$, $\frac{1}{4}$, and $\frac{3}{8}$ to 24ths. |
| 5. $\frac{3}{10}$ and $\frac{3}{20}$ to 100ths. | 11. $\frac{1}{3}$, $\frac{3}{4}$, and $\frac{4}{5}$ to 60ths. |
| 6. $\frac{3}{4}$ and $\frac{1}{6}$ to 36ths. | 12. $\frac{5}{6}$, $\frac{1}{9}$, and $\frac{2}{3}$ to 72ds. |

327. The **Least Common Denominator** (l. c. d.) of two or more fractions in their lowest terms is the least number that their denominators will divide:

Thus, the least common denominator of $\frac{2}{3}$, $\frac{3}{4}$, and $\frac{5}{6}$ is 12, for 12 is the least number that 3, 4, and 6 will divide.

328. Reduce $\frac{1}{2}$, $\frac{2}{3}$, and $\frac{3}{4}$ to similar fractions having their least common denominator.

The l. c. d. of $\frac{1}{2}$, $\frac{2}{3}$, and $\frac{3}{4}$ is readily seen to be 12.

Now, $12 = 6 \times 2$, 4×3 , or 3×4 .

$$\frac{1}{2} = \frac{6 \times 1}{6 \times 2} = \frac{6}{12}.$$

$$\frac{2}{3} = \frac{4 \times 2}{4 \times 3} = \frac{8}{12}.$$

$$\frac{3}{4} = \frac{3 \times 3}{3 \times 4} = \frac{9}{12}.$$

329. Exercise.

Reduce to similar fractions having their least common denominator :

1. $\frac{2}{3}$ and $\frac{4}{5}$.

4. $\frac{1}{2}$ and $\frac{3}{4}$.

7. $\frac{1}{2}$, $\frac{1}{3}$, and $\frac{1}{4}$.

2. $\frac{3}{4}$ and $\frac{4}{5}$.

5. $\frac{3}{4}$ and $\frac{7}{8}$.

8. $\frac{2}{3}$, $\frac{3}{4}$, and $\frac{5}{6}$.

3. $\frac{2}{5}$ and $\frac{5}{6}$.

6. $\frac{3}{5}$ and $\frac{1}{10}$.

9. $\frac{1}{2}$, $\frac{3}{4}$, and $\frac{3}{5}$.

330. Reduce $\frac{7}{12}$, $\frac{5}{8}$, and $\frac{9}{20}$ to similar fractions having their least common denominator.

When the l. c. d. cannot readily be seen, as in the above problem, it may be found thus :

$$12 = 2 \times 2 \times 3.$$

$$8 = 2 \times 2 \times 2.$$

$$20 = 2 \times 2 \times 5.$$

$$\text{l. c. d.} = 2 \times 2 \times$$

$$2 \times 3 \times 5, \text{ or } 120.$$

The l. c. d. must have in it the prime factors 2, 2, and 3 in order that 12 may divide it ; it must have in it the additional prime factor 2, in order that 8 may divide it, and the additional prime factor 5 in order that 20 may divide it.

$$\text{Now, } 120 \div 12 = 10 ; 120 \div 8 = 15 ; 120 \div 20 = 6.$$

$$120 = 10 \times 12, 15 \times 8, \text{ or } 6 \times 20.$$

$$\frac{7}{12} = \frac{10 \times 7}{10 \times 12} = \frac{70}{120}.$$

$$\frac{5}{8} = \frac{15 \times 5}{15 \times 8} = \frac{75}{120}.$$

$$\frac{9}{20} = \frac{6 \times 9}{6 \times 20} = \frac{54}{120}.$$

331. Exercise.

Reduce to similar fractions having their least common denominator :

1. $\frac{5}{12}$, $\frac{7}{20}$, and $\frac{2}{25}$.
2. $\frac{3}{8}$, $\frac{5}{12}$, and $\frac{13}{18}$.
3. $\frac{4}{25}$, $\frac{9}{50}$, and $\frac{2}{75}$.
4. $\frac{9}{24}$, $\frac{15}{32}$, and $\frac{17}{36}$.
5. $\frac{9}{20}$, $\frac{8}{30}$, and $\frac{13}{40}$.
6. $\frac{5}{24}$, $\frac{25}{36}$, and $\frac{9}{48}$.
7. $\frac{3}{10}$, $\frac{4}{15}$, and $\frac{6}{25}$.
8. $\frac{3}{14}$, $\frac{5}{21}$, and $\frac{9}{28}$.
9. $\frac{15}{18}$, $\frac{13}{18}$, and $\frac{11}{36}$.
10. $\frac{4}{9}$, $\frac{7}{15}$, and $\frac{5}{21}$.
11. $\frac{23}{35}$, $\frac{7}{50}$, and $\frac{2}{125}$.
12. $\frac{5}{24}$, $\frac{7}{36}$, and $\frac{11}{72}$.

Addition and Subtraction.**332. Find the sum of $\frac{3}{8}$, $\frac{3}{4}$, and $\frac{4}{5}$.**

$$\text{l. c. d.} = 40.$$

$$\frac{3}{8} = \frac{5 \times 3}{5 \times 8} = \frac{15}{40}$$

$$\frac{3}{4} = \frac{10 \times 3}{10 \times 4} = \frac{30}{40}.$$

$$\frac{4}{5} = \frac{8 \times 4}{8 \times 5} = \frac{32}{40}.$$

$$\text{Sum} = \frac{17}{40} = 1\frac{37}{40}.$$

333. Exercise.

Find the sum of :

1. $\frac{2}{3}$, $\frac{3}{4}$, and $\frac{4}{5}$.
2. $\frac{3}{4}$, $\frac{7}{8}$, and $\frac{1}{12}$.
3. $\frac{5}{6}$, $\frac{5}{12}$, and $\frac{11}{18}$.
4. $\frac{3}{8}$, $\frac{5}{16}$, and $\frac{3}{32}$.
5. $\frac{2}{5}$, $\frac{3}{10}$, and $\frac{1}{20}$.
6. $\frac{3}{4}$, $\frac{4}{5}$, and $\frac{3}{40}$.
7. $\frac{3}{8}$, $\frac{9}{10}$, and $\frac{7}{12}$.
8. $\frac{7}{10}$, $\frac{3}{32}$, and $\frac{5}{48}$.
9. $\frac{8}{9}$, $\frac{11}{18}$, and $\frac{5}{6}$.
10. $\frac{7}{10}$, $\frac{11}{20}$, and $\frac{6}{25}$.
11. $\frac{9}{16}$, $\frac{7}{12}$, and $\frac{11}{24}$.
12. $\frac{2}{15}$, $\frac{17}{30}$, and $\frac{58}{45}$.

334. Find the sum of $12\frac{1}{2}$, $16\frac{2}{3}$, and $18\frac{3}{4}$.

$$12\frac{1}{2} = 12\frac{6}{12}.$$

$$16\frac{2}{3} = 16\frac{8}{12}.$$

$$18\frac{3}{4} = 18\frac{9}{12}.$$

$$\text{Sum} = 46\frac{23}{12} = 47\frac{11}{6}.$$

335. Exercise.

Find the sum of :

- | | |
|--|---|
| 1. $6\frac{1}{2}$, $2\frac{1}{5}$, and $3\frac{1}{10}$. | 6. $14\frac{2}{5}$, $13\frac{1}{2}$, and $10\frac{1}{10}$. |
| 2. $7\frac{3}{4}$, $8\frac{1}{5}$, and $6\frac{1}{2}$. | 7. $17\frac{4}{5}$, $28\frac{7}{10}$, and $32\frac{2}{15}$. |
| 3. $9\frac{2}{3}$, $7\frac{1}{2}$, and $8\frac{5}{8}$. | 8. $28\frac{1}{5}$, $38\frac{3}{10}$, and 75 . |
| 4. $8\frac{1}{3}$, $6\frac{5}{8}$, and $9\frac{3}{9}$. | 9. $40\frac{3}{8}$, $7\frac{2}{3}$, and $125\frac{5}{8}$. |
| 5. $7\frac{5}{8}$, $9\frac{3}{16}$, and $4\frac{1}{2}$. | 10. $84\frac{1}{5}$, $75\frac{3}{10}$, and $96\frac{7}{10}$. |

336. Find the difference of $\frac{8}{15}$ and $\frac{3}{10}$.

$$\text{l. c. d.} = 60.$$

$$\frac{8}{15} = \frac{4 \times 8}{4 \times 15} = \frac{32}{60}.$$

$$\frac{3}{10} = \frac{6 \times 3}{6 \times 10} = \frac{18}{60}.$$

$$\text{Difference} = \frac{14}{60} = \frac{7}{30}.$$

337. Exercise.

Find the difference of :

- | | | |
|---------------------------------------|--|---|
| 1. $\frac{3}{4}$ and $\frac{2}{3}$. | 6. $\frac{3}{2}$ and $\frac{2}{5}$. | 11. $\frac{8}{9}$ and $\frac{2}{3}$. |
| 2. $\frac{4}{5}$ and $\frac{3}{4}$. | 7. $\frac{15}{16}$ and $\frac{3}{4}$. | 12. $\frac{5}{6}$ and $\frac{7}{9}$. |
| 3. $\frac{7}{8}$ and $\frac{5}{6}$. | 8. $\frac{17}{30}$ and $\frac{13}{45}$. | 13. $\frac{11}{27}$ and $\frac{5}{18}$. |
| 4. $\frac{7}{12}$ and $\frac{3}{8}$. | 9. $\frac{7}{24}$ and $\frac{5}{36}$. | 14. $\frac{13}{60}$ and $\frac{4}{75}$. |
| 5. $\frac{5}{4}$ and $\frac{5}{6}$. | 10. $\frac{8}{25}$ and $\frac{3}{50}$. | 15. $\frac{13}{24}$ and $\frac{13}{40}$. |

338. Find the difference of $18\frac{3}{4}$ and $9\frac{4}{5}$.

$$18\frac{3}{4} = 18\frac{15}{20} = 17\frac{35}{20}. \quad \text{SUG. } \frac{4}{5} \text{ cannot be taken from}$$

$$\frac{94}{5} = 9\frac{4}{5} = 9\frac{16}{20}. \quad \frac{15}{20}; \text{ hence, reduce 1 of the}$$

$$\text{Difference} = 8\frac{19}{20}. \quad 18 \text{ to } \frac{30}{20} \text{ and add } \frac{30}{20} \text{ to } \frac{15}{20}.$$

339. Exercise.

Find the difference of :

1. 25 and $6\frac{1}{4}$.
2. 100 and $37\frac{1}{2}$.
3. $87\frac{1}{2}$ and $62\frac{1}{2}$.
4. $66\frac{2}{3}$ and $33\frac{1}{3}$.
5. $87\frac{1}{2}$ and $18\frac{3}{4}$.
6. 100 and $44\frac{4}{9}$.
7. $70\frac{2}{5}$ and $25\frac{3}{10}$.
8. $42\frac{6}{7}$ and $14\frac{2}{7}$.
9. $75\frac{1}{4}$ and $28\frac{3}{4}$.
10. $90\frac{2}{3}$ and $25\frac{2}{3}$.
11. $111\frac{1}{2}$ and $55\frac{1}{4}$.
12. $111\frac{1}{3}$ and $77\frac{2}{3}$.
13. $333\frac{1}{3}$ and $107\frac{2}{3}$.
14. $270\frac{1}{2}$ and $112\frac{3}{4}$.
15. $120\frac{1}{8}$ and $76\frac{3}{4}$.

340. Exercise—Miscellaneous Problems.

1. A market woman received $\$1\frac{3}{4}$ for butter, $\$2\frac{3}{4}$ for eggs, $\$4\frac{1}{2}$ for vegetables, and $\$3\frac{3}{4}$ for fruit; how much did her produce amount to ?

2. $37\frac{1}{2}$ yards of bunting were sold from a piece containing 50 yards ; how much remained ?

3. To make a mixed tea a merchant used $12\frac{3}{4}$ pounds of green tea and $18\frac{7}{8}$ pounds of black tea ; how many pounds were there in the mixture ?

4. The sum of two numbers is 100 ; if one of them is $18\frac{3}{4}$, what is their difference ?

5. How much change should a customer receive from a \$10-bill, if he buys groceries to the amount of $\$5\frac{3}{4}$ and dry goods to the amount of $\$3\frac{3}{8}$?

6. A telegraph pole 40 feet long was set $4\frac{3}{4}$ feet in the ground ; how many feet of it were above ground ?

7. A farmer owns $124\frac{3}{8}$ acres of land ; if $25\frac{3}{4}$ acres of this is woodland and the rest farm land, how much farm land has he ?

8. A girl received a mark of $80\frac{1}{2}$ in arithmetic and $86\frac{1}{2}$ in geography ; what was her average in the two studies ?

9. Supply the missing number : $18\frac{3}{4} + 37\frac{1}{2} + ? = 100$.

10. 3 turkeys together weigh $20\frac{1}{4}$ pounds ; if one of them weighs $6\frac{3}{4}$ pounds and another $8\frac{1}{2}$ pounds, what does the third weigh ?

341. Exercise—Miscellaneous Problems.

1. $\frac{3}{10}$ of a dollar is equal to how many dimes ? How many cents ?

2. One-half of a dollar plus one-fifth of a dollar is how many tenths of a dollar ? How many cents ?

3. 25 quarter-dollars are equal to how many dollars ?

4. A man gave $\frac{1}{8}$ of his property to each of his 4 sons and the rest of it to his wife ; what part of the property did she receive ?

5. If half a yard of silk costs $\$ \frac{3}{4}$, how much does a yard cost ?

6. $\frac{1}{8}$ of a gallon plus $\frac{1}{4}$ of a gallon is how many eighths of a gallon ? How many pints ?

7. A lady who charged $\$1\frac{1}{2}$ a day for board should charge how much for 6 days' board ?

8. $\frac{1}{2}$ of a gallon of oil was taken from a can containing $1\frac{1}{4}$ gallons ; what part of a gallon remained ?

9. What does a boy gain on 10 Sunday newspapers, if he buys them at $2\frac{1}{2}$ cents each and sells them for 5 cents ?

10. I exchanged 30 half-dollars for dollar bills ; how many bills did I receive ?

11. At $\frac{3}{4}$ of a cent a pound, what is the value of 8 pounds of old iron ?

12. A teacher had 20 pounds of candy put up in half-pound boxes ; how many boxes were there ?

13. How far will a hoop go in turning 4 times, if the distance around it is $1\frac{1}{4}$ feet ?

14. A rod contains $5\frac{1}{2}$ yards ; how many yards are there in $\frac{1}{2}$ of a rod ?

15. Reduce $2\frac{2}{3}$ to an improper fraction.

16. At 18 cents a dozen, what will $2\frac{1}{2}$ dozen eggs cost ?

17. 6 men hire a car for \$18 $\frac{3}{4}$; how much should each man pay ?

18. $\frac{7}{8}$ of a gallon of maple syrup will fill how many bottles, each holding $\frac{1}{8}$ of a gallon ?

19. A farmer bought a plow for \$10 and gave in payment wheat worth \$7 $\frac{1}{2}$, and the balance in cash ; how much cash did he pay ?

20. Find the cost of all :

1 pair of shoes, \$2 $\frac{1}{2}$.

1 pair of gloves, \$ $\frac{3}{4}$.

1 handkerchief, \$ $\frac{1}{4}$.

21. $2\frac{1}{4}$ yards of ribbon were cut into pieces $\frac{1}{4}$ of a yard long ; how many pieces were made ?

22. If $\frac{1}{4}$ of a pound of tea costs \$ $\frac{2}{3}$, how much does a pound cost ?

23. A lady put $\frac{1}{4}$ of a pound of green tea into a can containing $\frac{1}{2}$ of a pound of black tea ; how much tea was there then in the can ?

24. A man bought a pair of shoes for \$2 $\frac{1}{4}$ and gave in payment a \$5-bill ; how much change should he receive ?

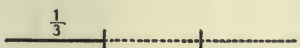
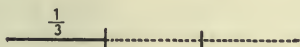
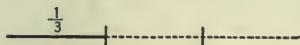
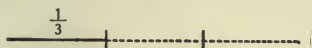
25. A farmer put up 10 $\frac{1}{2}$ pounds of butter in half-pound prints ; how many prints had he ?

26. Reduce $1\frac{3}{4}$ to a mixed number.

27. If 5 rakes cost $\$4$, what part of a dollar did each cost?

Multiplication.

342.



$\frac{1}{3}$ of 4 is $\frac{4}{3}$, or $1\frac{1}{3}$.

343. Oral Exercise.

What is :

- | | | | |
|-------------------------|-------------------------|-------------------------|---------------------------|
| 1. $\frac{1}{2}$ of 3 ? | 4. $\frac{1}{3}$ of 5 ? | 7. $\frac{1}{4}$ of 2 ? | 10. $\frac{1}{4}$ of 6 ? |
| 2. $\frac{1}{2}$ of 5 ? | 5. $\frac{1}{3}$ of 7 ? | 8. $\frac{1}{4}$ of 3 ? | 11. $\frac{1}{4}$ of 7 ? |
| 3. $\frac{1}{2}$ of 7 ? | 6. $\frac{1}{3}$ of 8 ? | 9. $\frac{1}{4}$ of 5 ? | 12. $\frac{1}{4}$ of 11 ? |

344. What is $\frac{2}{3}$ of 4 ?

$\frac{1}{3}$ of 4 is $\frac{4}{3}$, and $\frac{2}{3}$ of 4 is 2 times $\frac{4}{3}$, or $\frac{8}{3}$, or $2\frac{2}{3}$.

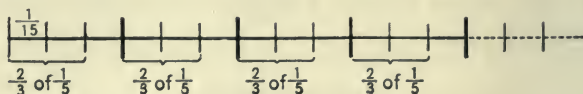
NOTE. $\frac{2}{3}$ of 4 and $\frac{2}{3} \times 4$ have the same meaning.

345. Oral Exercise.

What is :

- | | | | |
|--|-------------------------------|-------------------------------|-------------------------------|
| 1. $\frac{2}{3}$ of 5 ? | 6. $\frac{2}{3}$ of 7 ? | 10. $\frac{3}{4}$ of 6 ? | 15. $\frac{3}{4}$ of 3 ? |
| 2. $\frac{2}{5}$ of 7 ? | 7. $\frac{3}{5}$ of 6 ? | 11. $\frac{5}{6}$ of 3 ? | 16. $\frac{2}{3}$ of 8 ? |
| 3. $\frac{3}{4}$ of 2 ? | 8. $\frac{4}{5}$ of 3 ? | 12. $\frac{2}{7}$ of 9 ? | 17. $\frac{6}{5}$ of 4 ? |
| 4. $2\frac{1}{2} \times 4$, or $\frac{5}{2}$ of 4 ? | 13. $3\frac{1}{2} \times 3$? | 18. $2\frac{2}{5} \times 2$? | |
| 5. $2\frac{2}{3} \times 2$? | 9. $3\frac{1}{3} \times 3$? | 14. $1\frac{1}{4} \times 5$? | 19. $1\frac{1}{6} \times 2$? |

346. Here we see that $\frac{2}{3}$ of $\frac{4}{5} = \frac{8}{15} = \frac{2 \times 4}{3 \times 5}$.



Therefore,

The product of two fractions equals the product of their numerators divided by the product of their denominators.

NOTE. $\frac{2}{3}$ of $\frac{4}{5}$ and $\frac{2}{3} \times \frac{4}{5}$ have the same meaning.

347. Multiply $\frac{2}{3}$ by $\frac{2}{5}$.

$$\frac{2}{3} \times \frac{2}{5} = \frac{2 \times 2}{3 \times 5} = \frac{4}{15}.$$

348. Exercise.

Multiply :

- | | | | |
|---------------------------------------|---------------------------------------|---|--|
| 1. $\frac{2}{3} \times \frac{4}{5}$. | 5. $\frac{1}{4} \times \frac{7}{9}$. | 9. $\frac{9}{10} \times \frac{3}{4}$. | 13. $\frac{7}{8} \times \frac{4}{9}$. |
| 2. $\frac{2}{5} \times \frac{3}{4}$. | 6. $\frac{5}{6} \times \frac{4}{7}$. | 10. $\frac{12}{7} \times \frac{1}{5}$. | 14. $\frac{3}{10} \times \frac{3}{8}$. |
| 3. $\frac{4}{5} \times \frac{1}{6}$. | 7. $\frac{3}{2} \times \frac{4}{5}$. | 11. $\frac{3}{8} \times \frac{9}{10}$. | 15. $\frac{15}{16} \times \frac{3}{4}$. |
| 4. $\frac{3}{4} \times \frac{5}{8}$. | 8. $\frac{8}{9} \times \frac{6}{5}$. | 12. $\frac{7}{6} \times \frac{5}{4}$. | 16. $\frac{20}{21} \times \frac{4}{5}$. |

349. Multiply $1\frac{5}{8}$ by $\frac{8}{9}$.

$$\frac{8}{9} \times \frac{15}{16} = \frac{\overset{1}{\cancel{8}} \times \overset{5}{\cancel{15}}}{\underset{3}{\cancel{9}} \times \underset{2}{\cancel{16}}} = \frac{1 \times 5}{3 \times 2} = \frac{5}{6}.$$

To reduce the product to its lowest terms, we divide 8 and 16 by 8, and 15 and 9 by 3, and cancel, that is, cross out, the numbers divided.

In practice the work may be done thus :

$$\frac{\overset{1}{\cancel{8}}}{\underset{3}{\cancel{9}}} \times \frac{\overset{5}{\cancel{15}}}{\underset{2}{\cancel{16}}} = \frac{5}{6}.$$

350. $2\frac{2}{5}$ by $3\frac{1}{4}$.

$$3\frac{1}{4} \times 2\frac{2}{5} = \frac{13}{4} \times \frac{12^3}{5} = \frac{39}{5} = 7\frac{4}{5}.$$

351. Exercise.

Find the products:

1. $\frac{4}{6} \times \frac{1^0}{3}.$

9. $\frac{2}{3} \times 1\frac{1}{2}.$

17. $1\frac{1}{2} \times 1\frac{1}{3}.$

2. $\frac{4}{3} \times \frac{3}{6}.$

10. $\frac{3}{5} \times 2\frac{2}{3}.$

18. $4\frac{1}{2} \times 3\frac{2}{3}.$

3. $\frac{5}{6} \times \frac{3}{8}.$

11. $\frac{6}{7} \times 4\frac{1}{2}.$

19. $7\frac{1}{3} \times 2\frac{1}{2}.$

4. $\frac{2}{3} \times \frac{3}{4}.$

12. $\frac{3}{8} \times 1\frac{7}{9}.$

20. $3\frac{1}{3} \times 3\frac{1}{2}.$

5. $\frac{2}{9} \times \frac{6}{6}.$

13. $2\frac{3}{4} \times \frac{2}{9}.$

21. $4\frac{2}{3} \times 5\frac{1}{7}.$

6. $1\frac{1}{6} \times \frac{3^5}{4^8}.$

14. $3\frac{3}{8} \times \frac{4}{9}.$

22. $8\frac{2}{3} \times 7\frac{1}{2}.$

7. $\frac{2^5}{4} \times \frac{1^6}{1^6}.$

15. $7\frac{1}{3} \times \frac{3}{4}.$

23. $4\frac{3}{4} \times 2\frac{1}{4}.$

8. $\frac{9}{1^6} \times \frac{2^0}{1}.$

16. $4\frac{3}{4} \times \frac{2}{9}.$

24. $3\frac{1}{3} \times 6\frac{2}{5}.$

352. Multiply $166\frac{2}{3}$ by 7.

$$\begin{array}{r} 166\frac{2}{3} \\ \times 7 \\ \hline 1162 = 7 \times 166. \\ \quad 4\frac{2}{3} = 7 \times \frac{2}{3}. \\ \hline 1166\frac{2}{3} = 7 \times 166\frac{2}{3}. \end{array}$$

Multiply 126 by $5\frac{3}{4}$.

$$\begin{array}{r} 126 \\ \times 5\frac{3}{4} \\ \hline 630 = 5 \times 126. \\ \quad 94\frac{1}{2} = \frac{3}{4} \text{ of } 126. \\ \hline 724\frac{1}{2} = 5\frac{3}{4} \times 126. \end{array}$$

353. Exercise.

Multiply :

1. $216\frac{1}{2}$

5. $350\frac{5}{6}$

9. $415\frac{3}{8}$

13. 135

$$\begin{array}{r} 6 \\ \hline \end{array}$$

$$\begin{array}{r} 8 \\ \hline \end{array}$$

$$\begin{array}{r} 15 \\ \hline \end{array}$$

$$\begin{array}{r} 6\frac{1}{3} \\ \hline \end{array}$$

2. $335\frac{1}{4}$

6. $118\frac{4}{5}$

10. $600\frac{8}{9}$

14. 150

$$\begin{array}{r} 5 \\ \hline \end{array}$$

$$\begin{array}{r} 6 \\ \hline \end{array}$$

$$\begin{array}{r} 22 \\ \hline \end{array}$$

$$\begin{array}{r} 6\frac{1}{3} \\ \hline \end{array}$$

3. $206\frac{2}{3}$

7. $216\frac{4}{6}$

11. $406\frac{5}{6}$

15. 420

$$\begin{array}{r} 9 \\ \hline \end{array}$$

$$\begin{array}{r} 25 \\ \hline \end{array}$$

$$\begin{array}{r} 14 \\ \hline \end{array}$$

$$\begin{array}{r} 12\frac{1}{2} \\ \hline \end{array}$$

4. $418\frac{3}{4}$

8. $306\frac{2}{3}$

12. $324\frac{2}{5}$

16. 128

$$\begin{array}{r} 7 \\ \hline \end{array}$$

$$\begin{array}{r} 10 \\ \hline \end{array}$$

$$\begin{array}{r} 50 \\ \hline \end{array}$$

$$\begin{array}{r} 8\frac{1}{3} \\ \hline \end{array}$$

17. 235

$$\underline{5\frac{2}{3}}$$

18. 160

$$\underline{13\frac{3}{4}}$$

19. 220

$$\underline{9\frac{2}{3}}$$

20. 406

$$\underline{18\frac{3}{4}}$$

21. 422

$$\underline{11\frac{5}{8}}$$

22. 270

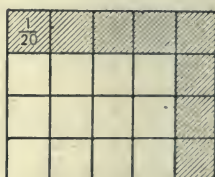
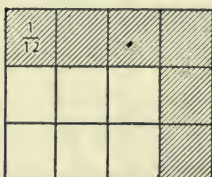
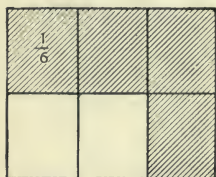
$$\underline{18\frac{4}{7}}$$

23. 200

$$\underline{25\frac{5}{8}}$$

24. 605

$$\underline{122\frac{2}{3}}$$

354. Oral Exercise—Miscellaneous Problems.

Read, supplying the missing numbers :

1. $\frac{1}{2} = \frac{\cdot}{6}$

2. $\frac{1}{3} = \frac{\cdot}{6}$

3. $\frac{2}{3} = \frac{\cdot}{6}$

4. $\frac{3}{3} = \frac{\cdot}{6}$

5. $\frac{2}{3} = \frac{\cdot}{6}$

6. $\frac{1}{2} + \frac{1}{3} = \frac{\cdot}{6}$

7. $\frac{1}{2} - \frac{1}{3} = \frac{\cdot}{6}$

8. $\frac{1}{2} + \frac{2}{3} = \frac{\cdot}{6}$

9. $\frac{2}{3} - \frac{1}{2} = \frac{\cdot}{6}$

10. $\frac{5}{6} - \frac{1}{3} = \frac{\cdot}{6}$

11. $1 - \frac{1}{2} = \frac{\cdot}{2}$

12. $1 - \frac{1}{3} = \frac{\cdot}{3}$

13. $1 - \frac{2}{3} = \frac{\cdot}{3}$

14. $1 - \frac{5}{6} = \frac{\cdot}{6}$

15. $1 - \frac{1}{6} = \frac{\cdot}{6}$

16. $\frac{1}{2}$ of $\frac{1}{3} = \cdot$

17. $\frac{1}{3}$ of $\frac{1}{2} = \cdot$

18. $\frac{1}{3} = \frac{\cdot}{12}$

19. $\frac{1}{4} = \frac{\cdot}{12}$

20. $\frac{2}{3} = \frac{\cdot}{12}$

21. $\frac{3}{4} = \frac{\cdot}{12}$

22. $\frac{1}{3} + \frac{1}{4} = \frac{\cdot}{12}$

23. $\frac{1}{3} - \frac{1}{4} = \frac{\cdot}{12}$

24. $\frac{2}{3} \times \frac{1}{4} = \frac{\cdot}{12}$

25. $\frac{3}{4} + \frac{1}{3} = \frac{\cdot}{12}$

26. $\frac{2}{3} + \frac{3}{4} = \frac{\cdot}{12}$

27. $\frac{2}{3} - \frac{1}{4} = \frac{\cdot}{12}$

28. $\frac{3}{4} - \frac{2}{3} = \frac{\cdot}{12}$

29. $1 - \frac{1}{12} = \frac{\cdot}{12}$

30. $1 - \frac{7}{12} = \frac{\cdot}{12}$

31. $1 - \frac{5}{12} = \frac{\cdot}{12}$

32. $1 - \frac{11}{12} = \frac{\cdot}{12}$

33. $\frac{1}{3}$ of $\frac{1}{4} = \cdot$

34. $\frac{1}{4}$ of $\frac{1}{3} = \cdot$

35. $\frac{1}{4} = \frac{\cdot}{20}$

36. $\frac{1}{5} = \frac{\cdot}{20}$

37. $\frac{3}{4} = \frac{\cdot}{20}$

38. $\frac{3}{5} = \frac{\cdot}{20}$

39. $\frac{4}{5} = \frac{\cdot}{20}$

40. $\frac{1}{5} + \frac{1}{4} = \frac{\cdot}{20}$

41. $\frac{1}{5} + \frac{3}{4} = \frac{\cdot}{20}$

42. $\frac{2}{5} + \frac{3}{4} = \frac{\cdot}{20}$

43. $1 - \frac{1}{5} = \frac{\cdot}{5}$

44. $\frac{1}{4} - \frac{1}{5} = \frac{\cdot}{20}$

45. $\frac{3}{4} - \frac{3}{5} = \frac{\cdot}{20}$

46. $\frac{3}{5} - \frac{1}{4} = \frac{\cdot}{20}$

47. $\frac{3}{4} - \frac{2}{5} = \frac{\cdot}{20}$

48. $1 - \frac{9}{20} = \frac{\cdot}{20}$

49. $\frac{9}{20} - \frac{1}{5} = \frac{\cdot}{20}$

50. $\frac{1}{4}$ of $\frac{1}{5} = \cdot$

51. $\frac{1}{5}$ of $\frac{1}{4} = \cdot$

355. Oral Exercise—Miscellaneous Problems.

1. When thread is selling at 3 spools for 10 cents, how much is that a spool?
2. 2 pounds of pepper were put up in 8 packages of equal size; what part of a pound did each contain?
3. 4 bottles of equal size together hold a pint; what part of a pint does each hold? What part of a pint do 2 of them hold?
4. What should $\frac{3}{4}$ of a yard of silk cost at $\$1\frac{1}{2}$ a yard?
5. A piece of cloth $1\frac{1}{4}$ yards long shrunk $\frac{1}{8}$ of a yard; how long was it then?
6. A can of lard weighed $36\frac{1}{2}$ pounds; if the can weighed $2\frac{1}{2}$ pounds, what was the weight of the lard?
7. How much should a laborer be paid for 6 days' work at $\$1\frac{1}{4}$ a day?
8. When matches are selling at 3 boxes for 5 cents, how much is that per dozen boxes?
9. If $1\frac{1}{2}$ bushels of grass seed are sowed on 6 acres, what part of a bushel is sowed on 1 acre?
10. Find the cost of $\frac{1}{4}$ of a pound of tea at 40 cents a pound, and $\frac{3}{4}$ of a pound of dried beef at 32 cents a pound.
11. A lady ordered 16 blocks of ice cream, each containing $\frac{1}{2}$ of a pint; how much did it cost her, at 40 cents a quart?
12. A lot containing $\frac{3}{4}$ of an acre was divided into 3 lots of equal size, and 2 of them were sold; what part of an acre was sold?
13. Reduce $\frac{1}{4}^2$ to an integer.

14. How many bushels of corn is $\frac{4}{5}$ of a barrel, if one barrel is $2\frac{1}{2}$ bushels?

15. A lady had $1\frac{1}{2}$ dozen eggs and used 9 of them; how many had she left?

16. Name the fraction equal to $\frac{3}{4}$ that has the smallest numerator and denominator possible.

17. If poultry lose about $\frac{1}{4}$ of their weight in dressing, how much should a 9-pound turkey weigh when dressed?

18. A milkman put $\frac{3}{4}$ of a gallon of cream into pint jars and sold each jar for 12 cents; how much did he receive?

Find the cost of:

19. $2\frac{1}{2}$ pounds of ham at 18 cents a pound.

20. $1\frac{1}{2}$ pounds of butter at 24 cents a pound.

21. $3\frac{3}{4}$ yards of cloth at 12 cents a yard.

22. $2\frac{1}{2}$ bushels of onions at \$1.50 a bushel.

23. $4\frac{1}{4}$ dozen eggs at 16 cents a dozen.

24. 3 bushels of seed at $\$5\frac{3}{4}$ a bushel.

25. 5 pair of gloves at $\$1\frac{1}{4}$ a pair.

26. 10 pounds of twine at $6\frac{1}{2}$ cents a pound.

27. 2 hundredweight of flour at $\$1\frac{3}{5}$ a hundredweight.

28. 6 pounds of beefsteak at $12\frac{1}{2}$ cents a pound.

356. Exercise—Miscellaneous Problems.

1. When eggs are selling at 24 cents a dozen, how much should be paid for $10\frac{3}{4}$ dozen?

2. 66 feet make 4 rods; how many feet make a rod?

3. Find the selling price of 10 sheep at an average price of $\$5\frac{3}{4}$ a head.

4. Find the selling price of $65\frac{1}{2}$ bushels of wheat at \$0.80 per bushel.
5. Allowing each of 25 sailors $1\frac{3}{4}$ pounds of meat daily, how much meat must be supplied for them for a cruise of 10 days?
6. A barrel holding $42\frac{1}{2}$ gallons is $\frac{3}{4}$ full of syrup; how many gallons of syrup are there in the barrel?
7. What should be paid for $12\frac{1}{2}$ cords of chestnut wood at \$1 $\frac{1}{4}$ a cord?
8. A dealer bought 28 pigs at \$6 $\frac{1}{4}$ a pair, and after keeping them 10 weeks at a cost of \$2 $\frac{1}{4}$ a week, sold them for \$10 $\frac{3}{4}$ a pair; find his gain.
9. Find the weight of a bolt of dress flannel of 40 yards, if each yard weighs $\frac{5}{16}$ of a pound.
10. If $\frac{3}{4}$ of a number is 42, what is $2\frac{1}{2}$ times the number?
11. A farmer sold 332 pounds of leaf tobacco at \$0.07 $\frac{3}{4}$ a pound; how much did he receive for it?
12. A dealer sold a plow for \$6 $\frac{3}{4}$; if $\frac{1}{4}$ of this sum was gain, what was the cost?
13. A laborer worked $10\frac{1}{2}$ hours a day for the 6 working days of a week; if his wages were \$0.12 $\frac{1}{2}$ an hour, how much did he earn?
14. A farmer sows $2\frac{1}{2}$ bushels of wheat to the acre; how much does he sow on a field containing $10\frac{1}{2}$ acres?
15. What do $3\frac{3}{4}$ dozen arithmetics cost, at \$5.76 a dozen?
16. When hay is selling for \$18 $\frac{3}{4}$ a ton, what should be paid for $\frac{4}{5}$ of a ton?
17. From a piece of cloth containing 40 yards there

were sold $2\frac{1}{2}$ yards, $18\frac{3}{4}$ yards, and 6 yards. Find the value of the remainder at 16 cents a yard.

Division and Mensuration.

357. 4 is $\frac{2}{3}$ of what number?

$\frac{2}{3}$ of a number	$\left\{ \begin{array}{l} \rule{2cm}{0.4pt} \\ \rule{2cm}{0.4pt} \\ \rule{2cm}{0.4pt} \end{array} \right.$	$\frac{1}{3}$ of the number	If $\frac{2}{3}$ of a number is 4,
		$\frac{1}{3}$ of the number	$\frac{1}{3}$ of the number is $\frac{1}{2}$ of
		$\frac{1}{3}$ of the number	4, or —, and $\frac{2}{3}$ of the
			number is 3 times —,
			or—.

358. Oral Exercise.

1. If $\frac{1}{2}$ of a number is 3, $\frac{2}{3}$ of the number is 2 times —, or —.
2. If $\frac{2}{3}$ of a number is 2, what is the number?
3. 9 is $\frac{3}{4}$ of what number?
4. 4 is $\frac{1}{2}$ of what number?
5. 10 is $\frac{5}{8}$ of what number?
6. 16 is $\frac{8}{9}$ of what number?
7. If $\frac{4}{5}$ of the length of a line is 8 inches, $\frac{1}{5}$ of its length is $\frac{1}{4}$ of — inches, or — inches, and $\frac{5}{8}$ of its length is — times — inches, or — inches.
8. $\frac{5}{6}$ of the weight of a bushel of wheat is 50 pounds; what is the weight of a bushel of wheat?
9. A boy spelled correctly 20 words, which was $\frac{4}{5}$ of the number he was given; how many was he given?
10. A farmer sold a cow for 32 dollars, which was $\frac{8}{9}$ of her cost; what was her cost?

359.

(1) If $3 \times \text{a number} = 12$, the number $= 12 \div 3$.(2) If $3 \times \text{a number} = \frac{3}{4}$, the number $= \frac{3}{4} \div 3$.(3) If $\frac{2}{3} \times \text{a number} = \frac{3}{4}$, the number $= \frac{3}{4} \div \frac{2}{3}$.Now, if $\frac{2}{3}$ of a number $= \frac{3}{4}$, $\frac{1}{3}$ of the number $= \frac{1}{2}$ of $\frac{3}{4}$.And $\frac{3}{3}$ of the number $= 3 \times \frac{1}{2}$ of $\frac{3}{4}$, or $\frac{3}{2}$ of $\frac{3}{4}$.That is, the number $= \frac{3}{2} \times \frac{3}{4}$.But the number $= \frac{3}{4} \div \frac{2}{3}$. [See (3).]Therefore, $\frac{3}{4} \div \frac{2}{3} = \frac{3}{2} \times \frac{3}{4}$. $\frac{3}{2}$ is called the *inverse* of $\frac{2}{3}$.

Therefore,

*To divide by a fraction, multiply by the inverse of the fraction.*360. Divide $\frac{4}{5}$ by $\frac{2}{3}$.

$$\frac{4}{5} \div \frac{2}{3} = \frac{4}{5} \times \frac{3}{2} = \frac{6}{5} = 1 - \frac{1}{5}.$$

Divide 4 by $\frac{2}{3}$.

$$4 \div \frac{2}{3} = \frac{6}{2} \times 4 = \frac{24}{2} = 12.$$

361. Exercise.

Find the quotients :

1. $\frac{2}{3} \div \frac{3}{4}$.

9. $2 \div \frac{2}{3}$.

17. $1\frac{1}{2} \div 1\frac{1}{3}$.

2. $\frac{4}{5} \div \frac{3}{4}$.

10. $3 \div \frac{4}{5}$.

18. $3\frac{1}{3} \div 1\frac{3}{4}$.

3. $\frac{6}{7} \div \frac{8}{9}$.

11. $7 \div \frac{3}{4}$.

19. $2\frac{1}{2} \div 7\frac{1}{2}$.

4. $\frac{9}{10} \div \frac{3}{2}$.

12. $5 \div \frac{5}{4}$.

20. $3\frac{1}{3} \div 2\frac{1}{2}$.

5. $1\frac{5}{6} \div \frac{3}{4}$.

13. $4 \div 1\frac{1}{3}$.

21. $1\frac{3}{4} \div 5\frac{1}{4}$.

6. $\frac{7}{8} \div \frac{9}{10}$.

14. $9 \div 3\frac{1}{2}$.

22. $1\frac{2}{3} \div 6\frac{2}{3}$.

7. $\frac{9}{16} \div 1\frac{1}{2}$.

15. $8 \div 3\frac{2}{3}$.

23. $12\frac{1}{2} \div 6\frac{1}{4}$.

8. $\frac{5}{9} \div \frac{2}{3}\frac{1}{4}$.

16. $4 \div 7\frac{1}{2}$.

24. $2\frac{6}{7} \div 14\frac{2}{7}$.

362. Divide $233\frac{1}{3}$ by $12\frac{1}{2}$.

$$12\frac{1}{2} \quad 233\frac{1}{3}$$

$$\begin{array}{r} 6 \\ \hline \end{array} \quad \begin{array}{r} 6 \\ \hline \end{array}$$

$$75) \quad 1400 \quad (18\frac{2}{3}$$

$$\begin{array}{r} 75 \\ \hline \end{array}$$

$$650$$

$$\begin{array}{r} 600 \\ \hline \end{array}$$

$$\frac{50}{75} = \frac{2}{3}$$

Multiply both dividend and divisor by the l. c. d. of the fractions before dividing.

363. Exercise.

Divide :

1. 100 by $14\frac{2}{3}$.

6. $144\frac{4}{9}$ by $6\frac{2}{3}$.

2. $87\frac{1}{2}$ by $62\frac{1}{2}$.

7. $262\frac{1}{2}$ by $18\frac{3}{4}$.

3. $133\frac{1}{3}$ by $66\frac{2}{3}$.

8. $183\frac{1}{3}$ by $26\frac{2}{3}$.

4. $112\frac{1}{2}$ by $6\frac{1}{4}$.

9. $237\frac{1}{2}$ by $33\frac{1}{3}$.

5. $187\frac{1}{2}$ by 25 .

10. $666\frac{2}{3}$ by $55\frac{5}{9}$.

364. Oral Exercise.

1. If 9 cents is $\frac{1}{5}$ of a sum of money, what is the sum?

2. If $\frac{1}{2}$ of a melon costs 10 cents, what will 2 melons cost?

3. If 3 pecks of potatoes cost 60 cents, 1 peck costs $\frac{1}{3}$ of — cents, or — cents; and 4 pecks cost $4 \times$ — cents, or — cents.

4. If 3 pecks of apples cost $\frac{3}{4}$ of a dollar, 1 peck costs $\frac{1}{4}$ of — of a dollar, or — of a dollar; and 4 pecks cost 4 times — of a dollar, or — of a dollar.

5. If $\frac{3}{4}$ of a bushel of apples costs $\frac{3}{4}$ of a dollar, $\frac{1}{4}$ of a bushel costs $\frac{1}{4}$ of — of a dollar, or — of a dollar; and 4 of a bushel costs 4 times — of a dollar, or — of a dollar.

6. When $\frac{3}{8}$ of a pound of tea cost 36 cents, how much is that a pound?

7. A farmer received \$24 for $\frac{3}{8}$ of his tobacco crop; what should he receive for the whole crop at the same rate?

8. If $\frac{4}{7}$ of a number is $1\frac{3}{8}$, what is $\frac{1}{7}$ of the number?

9. If $\frac{3}{4}$ of an inch on a map represents a mile, what does an inch on the map represent?

10. $3\frac{1}{3}$ is $\frac{5}{6}$ of what number?

11. A laborer saves \$ $\frac{7}{8}$ a day, which is $\frac{2}{3}$ of his daily wages; what are his daily wages?

12. $2\frac{1}{2}$ is $\frac{2}{3}$ of what number?

13. If $\frac{3}{8}$ of the length of a line is $2\frac{1}{2}$ inches, what is $\frac{1}{8}$ of its length? What is its length?

14. In $\frac{2}{3}$ of a week a laborer earned \$4.50; what should he earn in a week?

15. 2 dimes are $\frac{4}{5}$ of how many cents?

365. Exercise.

1. If 2,000 pounds of fertilizer are put up in 12 bags of equal size, how many pounds does each bag contain?

2. A farmer sold a load of 50 bushels of oats which weighed 1,575 pounds; what did each bushel weigh?

3. A drover bought 20 sheep for \$130; what was the average price paid per head?

4. If an echo traveled $2,191\frac{1}{2}$ feet in 2 seconds, how far did it travel per second?

5. If it cost \$136,000 to build $8\frac{1}{2}$ miles of a trolley line, how much did it cost per mile on an average?

6. A train that ran 160 miles in $2\frac{1}{4}$ hours, ran how far each hour on an average?

7. How much was paid per dozen for eggs, when $\$16\frac{1}{2}$ was paid for 54 dozen?

8. A can pay only $\frac{4}{5}$ of what he owes B; if he can pay B $\$1,004\frac{1}{2}$, how much does he owe B?

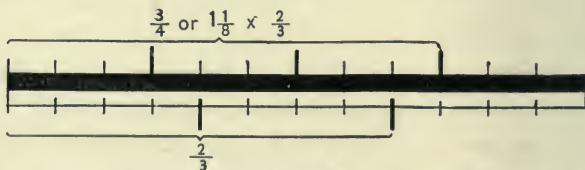
9. A's farmer returned him $\$220\frac{1}{2}$ from a sale of corn; if A received $\frac{2}{3}$ of the selling price of the corn, how much did the farmer receive? What did the sale amount to?

10. A bushel of corn weighs 56 pounds, which is $1\frac{1}{5}$ of the weight of a bushel of clover seed; what is the weight of a bushel of clover seed?

11. A woodchopper was paid $\$6\frac{1}{4}$ for chopping $12\frac{1}{2}$ cords of wood; how much was that a cord?

12. A laborer earned $\$7\frac{1}{8}$ in $4\frac{1}{2}$ days; how much did he earn per day?

366. How many times is $\frac{2}{3}$ contained in $\frac{3}{4}$?



Since $\frac{3}{4}$ equals $1\frac{1}{8}$ and $\frac{2}{3}$ equals $1\frac{2}{3}$, $\frac{2}{3}$ is contained in $\frac{3}{4}$ as many times as 8 is contained in 9, or $\frac{8}{9}$, or $1\frac{1}{9}$.

367. Oral Exercise.

(Reduce whole or mixed numbers to improper fractions.)

How many times is:

1. $\frac{2}{3}$ contained in $\frac{4}{5}$? 3. $\frac{1}{2}$ contained in 1 ?
2. $\frac{1}{4}$ contained in $\frac{1}{2}$? 4. $\frac{2}{3}$ contained in 1 ?

- | | |
|--|--|
| 5. $\frac{1}{2}$ contained in $\frac{3}{4}$? | 13. $1\frac{1}{4}$ contained in $1\frac{3}{4}$? |
| 6. $\frac{1}{2}$ contained in 2 ? | 14. 1 contained in $\frac{2}{3}$? |
| 7. $\frac{3}{4}$ contained in $\frac{2}{3}$? | 15. $1\frac{2}{5}$ contained in $2\frac{1}{2}$? |
| 8. $\frac{3}{4}$ contained in 4 ? | 16. 3 contained in $1\frac{2}{5}$? |
| 9. $\frac{4}{5}$ contained in $\frac{2}{3}$? | 17. $2\frac{3}{4}$ contained in $1\frac{1}{2}$? |
| 10. $\frac{3}{5}$ contained in 5 ? | 18. $1\frac{1}{2}$ contained in 1 ? |
| 11. $\frac{4}{5}$ contained in $\frac{5}{6}$? | 19. $2\frac{1}{2}$ contained in $3\frac{3}{4}$? |
| 12. 1 contained in $\frac{1}{2}$? | 20. 2 contained in $1\frac{3}{4}$? |

368. To measure $\frac{3}{4}$ by $\frac{2}{3}$ is to find how many times $\frac{2}{3}$ is contained in $\frac{3}{4}$.

369. *To measure one fraction by another, reduce them to a common denominator and divide the numerator of the first by the numerator of the second.*

Thus, $\frac{3}{4} : \frac{2}{3} = \frac{9}{12} : \frac{8}{12} = 9 \div 8 = \frac{9}{8}$, or $1\frac{1}{8}$.

370. Exercise.

Find the value of :

- | | | |
|-------------------------------------|-------------------------------------|------------------------------------|
| 1. $\frac{10}{12} : \frac{4}{5}$. | 4. $7\frac{1}{2} : 1\frac{1}{2}$. | 7. $\frac{5}{33} : 7\frac{1}{3}$. |
| 2. $\frac{5}{9} : 7\frac{7}{2}$. | 5. $\frac{24}{5} : 7$. | 8. $25 : 5\frac{1}{2}$. |
| 3. $1\frac{4}{5} : 1\frac{9}{10}$. | 6. $16\frac{1}{2} : 1\frac{3}{4}$. | 9. $6\frac{2}{3} : 24$. |

371. Oral Exercise.

1. If a boy has \$2 in quarter-dollars and \$3 in half-dollars, how many pieces of money has he?
2. What part of 2 quarts is 1 quart?
3. \$1 is $\frac{1}{5}$ of \$5, and \$3 is 3 times $\frac{1}{5}$ of \$5, or — of \$5.
4. What part of 12 inches is 4 inches?

5. When coal is selling for \$6 a ton, what part of a ton can be bought for \$2?

6. A lady spent \$3 for cloth at $\$ \frac{3}{4}$ a yard; how many yards did she buy?

Since \$3 equal $\$ \frac{1}{4}$, the number of yards she bought at $\$ \frac{3}{4}$ a yard was 12 divided by 3, or 4.

7. How many ropes, each $\frac{2}{3}$ of a foot long, can be made from a 6-foot rope?

8. When apples are selling at $\$ \frac{1}{5}$ a peck, how many pecks can be bought for $\$ \frac{2}{3}$?

9. If coal is selling at \$6 a ton, what part of a ton can be bought for $\$ 1 \frac{1}{2}$?

Since $\$ 1 \frac{1}{2}$ equal $\$ \frac{3}{2}$ and \$6 equal $\$ \frac{1}{2}$, the part of a ton that can be bought is 3 divided by 12, or $\frac{3}{12}$, or $\frac{1}{4}$.

10. When potatoes are selling at $\$ \frac{4}{5}$ a bushel, how many bushels can be bought for \$5?

372. Exercise.

1. How many times is $12 \frac{1}{2}$ contained in 200?

2. At $6 \frac{1}{4}$ ct. a pound, how many pounds of sugar can be bought for 75 ct.?

3. If the distance around a wheel is $7 \frac{1}{2}$ ft., how many times will the wheel turn in going 2,640 ft.?

4. A dealer bought cloth at 75 ct. a yard and sold it at $87 \frac{1}{2}$ ct. a yard; his gain was 75 ct. How many yards of this cloth did he sell?

5. If the cost of an article is 50 ct. and the selling price $62 \frac{1}{2}$ ct., what part of the cost is gained in the sale?

6. A barrel contains $31\frac{1}{2}$ gal. and a hogshead 63 gal. How many barrels are there in a hogshead?

7. If a house valued at \$5,000 rents for $\$33\frac{1}{3}$ a month, in how many months will the rent amount to the value of the house?

8. How many trees are there along a street for a distance of 330 ft., if they are placed $16\frac{1}{2}$ ft. apart?

373. Exercise—Miscellaneous Problems.

1. Supply the missing number:

$$9\frac{3}{4} + 37\frac{1}{2} + 50 + ? + 6\frac{1}{2} = 150.$$

2. A dealer bought a machine for $\$22\frac{1}{2}$ and sold it at a gain of $\frac{3}{8}$ of the cost; find the selling price.

3. How many bushels were there in my wheat crop, if, after selling $\frac{2}{5}$ of it, I had 353 bu. left?

4. 66 ft. make 4 rods; how many feet make $2\frac{1}{2}$ rods?

5. Which is the larger fraction and by how much, $\frac{5}{21}$ or $\frac{7}{30}$?

6. A farmer raised 270 bu. of oats on $7\frac{1}{2}$ acres; what was the yield per acre?

7. If 8 men can do a piece of work in 10 days, how long should it take 15 men to do it?

SUG. 1 man can do the work in 8×10 da., or 80 da.

15 men can do the work in $\frac{1}{15}$ of 80 da.

8. If 6 men can do a piece of work in $7\frac{1}{2}$ days, how long should it take 5 men to do it?

9. $1,000 - 12\frac{1}{2} = ?$

10. I bought a house and 40 acres of land for \$5,500. If the house was valued at \$250, what was the value of the land per acre?

Complex Fractions.

374. Such expressions as $\frac{\frac{2}{3}}{4}$, $\frac{2}{\frac{3}{4}}$, $\frac{\frac{2}{3}}{\frac{3}{4}}$, and $\frac{2\frac{1}{2}}{12\frac{1}{2}}$ are called **Complex Fractions**. They denote that the numerator is to be divided by the denominator.

Thus, $\frac{\frac{2}{3}}{4}$ denotes that $\frac{2}{3}$ is to be divided by 4.

375. Reduce $\frac{\frac{2}{3}}{4}$ to its simplest form.

$$\frac{\frac{2}{3}}{4} = \frac{3 \times \frac{2}{3}}{3 \times 4} = \frac{2}{12}, \text{ or } \frac{1}{6}.$$

376. Exercise.

Reduce to simplest form :

1. $\frac{1\frac{1}{2}}{4}.$

9. $\frac{5}{1\frac{0}{3}}.$

17. $\frac{100}{62\frac{1}{2}}.$

2. $\frac{\frac{2}{3}}{2}.$

10. $\frac{1\frac{1}{2}}{5}.$

18. $\frac{87\frac{1}{2}}{100}.$

3. $\frac{\frac{4}{5}}{3}.$

11. $\frac{2\frac{1}{2}}{10}.$

19. $\frac{12\frac{1}{2}}{50}.$

4. $\frac{2}{\frac{1}{3}}.$

12. $\frac{6\frac{2}{3}}{20}.$

20. $\frac{\frac{2}{3}}{\frac{3}{4}}.$

5. $\frac{3}{\frac{4}{6}}.$

13. $\frac{1}{3\frac{1}{3}}.$

21. $\frac{\frac{2}{3}}{6\frac{2}{3}}.$

6. $\frac{5}{\frac{3}{4}}.$

14. $\frac{10}{16\frac{2}{3}}.$

22. $\frac{14\frac{2}{7}}{\frac{6}{7}}.$

7. $\frac{6}{1\frac{0}{3}}.$

15. $\frac{25}{37\frac{1}{2}}.$

23. $\frac{37\frac{1}{2}}{87\frac{1}{2}}.$

8. $\frac{1}{\frac{3}{2}}.$

16. $\frac{100}{37\frac{1}{2}}.$

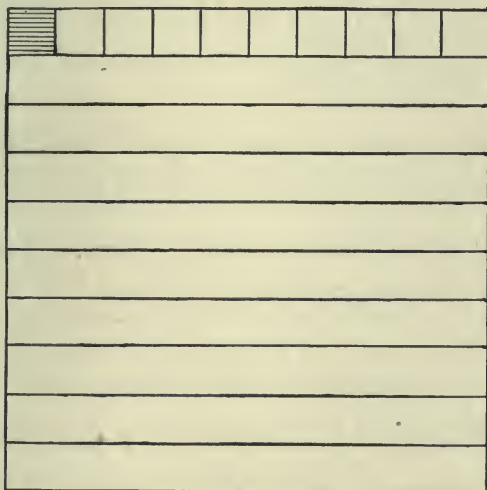
24. $\frac{66\frac{2}{3}}{16\frac{2}{3}}.$

CHAPTER III.

DECIMALS.

Introductory Problems and Definitions.

377. Oral Exercise.



1. Into how many equal strips is this square divided ?
2. What part of the whole square is each strip ?
3. Into how many equal squares is the first strip divided ?
4. What part of a strip is a small square ?

5. How many small squares would the large square make?
6. What part of the large square is a small square?
7. Into how many equal strips is one of the small squares divided?
8. How many small strips would a large strip make?
9. How many small strips would the large square make?
10. A small strip is what part of the whole square?
11. How many tenths are there in one?
12. How many hundredths are there in one tenth?
13. How many thousandths are there in one hundredth?
14. What is $\frac{1}{10}$ of $\frac{1}{10}$?
15. What is $\frac{1}{10}$ of $\frac{1}{100}$?

378. If anything is divided into 10, 100, 1000, etc., equal parts, these parts are called **Decimal Parts**.

379. Any number of decimal parts of a unit is a **Decimal Fraction**, or simply a **Decimal**.

Reading and Writing Decimals.

380. Decimal fractions may be written without a denominator. A figure written in the first place to the right of the decimal point expresses *tenths*; in the second place, *hundredths*; in the third place, *thousandths*; in the fourth place, *ten-thousandths*; in the fifth place, *hundred-thousandths*; in the sixth place, *millionths*.

381.

TABLE.

5	3	8	7	4	2	3	.	2	3	5	6	4	8
Millions	Hundred-thousands	Ten-thousands	Thousands	Hundreds	Tens	Units		Tenths	Hundredths	Thousandths	Ten-thousandths	Hundred-thousandths	Millionths
Integral part								Decimal part					

382. Oral Exercise.

1. Name the first place to the right of the decimal point; the second; the fourth; the fifth; the third; the sixth.

2. Beginning at the decimal point, name the decimal places in their order.

3. Counting from the decimal point, what is the number of the tenths' place? the hundred-thousandths'? the thousandths'? the millionths'? the hundredths'? the ten-thousandths'?

4. In the number written in the Table, how many tenths are there? how many thousandths? how many hundred-thousandths? how many tens? how many hundreds? how many thousands? how many millionths? how many millions?

383. Oral Exercise.

Read:

1. .01; .0001; .1; .00001; .001; .000001.

2. .02.; .003; .0004; .5; .000007; .000009.

3. .006.; .7; .09; .0006; .000008; .000007.

4. .3.; .007; .08; .0005; .000002.

384. Exercise.

Write in words:

- | | |
|-------------------------|-----------------------|
| 1. .01, also .1. | 5. .0007, also .08. |
| 2. .001, also .00001. | 6. .00009, also .006. |
| 3. .0001, also .000001. | 7. .02, also .0004. |
| 4. .2, also .002. | 8. .007, also .00005. |

385. Exercise.

Write as decimals:

- | | |
|---|---|
| 1. $\frac{1}{100}$; $\frac{2}{10}$; $\frac{3}{1000}$. | 4. $\frac{6}{10}$; $\frac{5}{1000}$; $\frac{6}{100}$. |
| 2. $\frac{4}{10}$; $\frac{6}{10000}$; $\frac{7}{1000000}$. | 5. $\frac{4}{1000}$; $\frac{6}{1000000}$; $\frac{4}{10}$. |
| 3. $\frac{3}{100}$; $\frac{6}{10000}$; $\frac{4}{10000000}$. | 6. $\frac{7}{100}$; $\frac{8}{1000}$; $\frac{9}{1000000}$. |

386.

$.325 = \frac{3}{10} + \frac{2}{100} + \frac{5}{1000} = \frac{300}{1000} + \frac{20}{1000} + \frac{5}{1000} = \frac{325}{1000} = 325$ thousandths. Hence,

Read the decimal as a whole number and give it the name of the place occupied by the right-hand figure.

Thus, .0025 is read *twenty-five ten-thousandths*, and 7.64 is read *seven and sixty-four hundredths*.

387. Oral Exercise.

Read :

- | | | | |
|----------|------------|-------------|--------------|
| 1. .25. | 6. .201. | 11. .30014. | 16. .000204. |
| 2. .37. | 7. .0028. | 12. .00154. | 17. 12.5. |
| 3. .752. | 8. .0325. | 13. .00302. | 18. 13.07. |
| 4. .082. | 9. .7248. | 14. .403. | 19. 28.375. |
| 5. .030. | 10. .2004. | 15. 7.24. | 20. 36.004. |

388. $.02\frac{1}{4}$ is read *two and one fourth hundredths*; and $3.12\frac{1}{2}$ is read *three and twelve and one half hundredths*.

389. Oral Exercise.

Read :

- | | | | |
|-----------------------|-----------------------|------------------------|-------------------------|
| 1. $.06\frac{1}{4}$. | 4. $.62\frac{1}{2}$. | 7. $.08\frac{1}{3}$. | 10. $6.66\frac{2}{3}$. |
| 2. $.12\frac{1}{2}$. | 5. $.87\frac{1}{2}$. | 8. $.037\frac{1}{2}$. | 11. $4.18\frac{3}{4}$. |
| 3. $.37\frac{1}{2}$. | 6. $.16\frac{2}{3}$. | 9. $.33\frac{1}{3}$. | 12. $5.07\frac{1}{2}$. |

390. Exercise.

Write in decimal form:

- | | | | |
|------------------------|--------------------------|-------------------------|-------------------------|
| 1. $\frac{3}{10}$. | 4. $\frac{5}{1000}$. | 7. $\frac{161}{100}$. | 10. $3\frac{5}{10}$. |
| 2. $\frac{4}{100}$. | 5. $\frac{5}{100000}$. | 8. $\frac{25}{1000}$. | 11. $7\frac{9}{100}$. |
| 3. $\frac{3}{10000}$. | 6. $\frac{8}{1000000}$. | 9. $\frac{325}{1000}$. | 12. $8\frac{7}{1000}$. |

13. 18 hundredths.
14. 15 ten-thousandths.
15. 25 thousandths.
16. 607 thousandths.
17. 18 millionths.
18. 185 hundred-thousandths.
19. 325 ten-thousandths.
20. Twenty-eight hundredths.
21. Six and twenty-one thousandths.
22. Two hundred four millionths.
23. Twenty and seven tenths.
24. Two hundred six thousandths.
25. Two hundred and six thousandths.

SUG. Two hundred is an integer.

26. Nine hundred and four thousandths.

27. Six hundred and five hundredths.

Reduction.

391. Oral Exercise.

1. When both terms of $\frac{8}{10}$ are multiplied by 10, what is the result?

2. Does $\frac{8}{10}$ equal $\frac{80}{100}$? Why? [§ 301].

3. When both terms of $\frac{8}{10}$ are multiplied by 100, what is the result?

4. Does $\frac{8}{10}$ equal $\frac{800}{1000}$? Why?

5. When both terms of $\frac{8}{10}$ are multiplied by 1000, what is the result?

6. Does $\frac{8}{10}$ equal $\frac{8000}{10000}$? Why?

7. Does $\frac{8}{10}$ equal $\frac{80000}{100000}$? Why?

8. By what must both terms of $\frac{80}{100}$ be divided in order that the result may be $\frac{8}{10}$?

9. Does dividing both terms of $\frac{80}{100}$ by 10 change the value of the fraction? Why?

10. Does $\frac{800}{1000}$ equal $\frac{8}{10}$? Why?

11. Does $\frac{8000}{10000}$ equal $\frac{8}{10}$? Why?

12. Does $\frac{80000}{100000}$ equal $\frac{8}{10}$? Why?

392. $\frac{8}{10} = \frac{80}{100} = \frac{800}{1000} = \frac{8000}{10000} = \frac{80000}{100000}$.

Therefore, $.8 = .80 = .800 = .8000 = .80000$.

Hence,

Annexing ciphers to a decimal does not change its value.

Removing ciphers from the right of a decimal does not change its value.

393. Exercise.

Reduce:

- | | |
|-----------------------------|-----------------------------|
| 1. .2 to hundredths. | 7. .2 to thousandths. |
| 2. .64 to thousandths. | 8. .04 to thousandths. |
| 3. .255 to ten-thousandths. | 9. .005 to millionths. |
| 4. .20 to tenths. | 10. .200 to tenths. |
| 5. .240 to hundredths. | 11. .6000 to hundredths. |
| 6. .5000 to tenths. | 12. .25 to ten-thousandths. |

394. Reduce .425 to a common fraction.

$$.425 = \frac{425}{1000} = \frac{17}{40}.$$

395. Exercise.

Reduce to common fractions or mixed numbers:

- | | | |
|----------|-----------|-------------|
| 1. .6. | 5. .075. | 9. 7.5. |
| 2. .08. | 6. .225. | 10. 1.08. |
| 3. .25. | 7. .450. | 11. 12.012. |
| 4. .004. | 8. .0025. | 12. 6.775. |

396. Reduce $.16\frac{2}{3}$ to a common fraction.

$$.16\frac{2}{3} = \frac{16\frac{2}{3}}{100} = \frac{3 \times 16\frac{2}{3}}{3 \times 100} = \frac{50}{300} = \frac{1}{6}.$$

397. Exercise.

Reduce to common fractions:

- | | | |
|-----------------------|-----------------------|------------------------|
| 1. $.8\frac{1}{3}$. | 5. $.14\frac{2}{3}$. | 9. $.87\frac{1}{2}$. |
| 2. $.6\frac{1}{4}$. | 6. $.33\frac{1}{3}$. | 10. $.83\frac{1}{3}$. |
| 3. $.12\frac{1}{2}$. | 7. $.66\frac{2}{3}$. | 11. $.28\frac{1}{4}$. |
| 4. $.16\frac{2}{3}$. | 8. $.18\frac{3}{4}$. | 12. $.42\frac{6}{7}$. |

398. Reduce $\frac{3}{4}$ to a decimal.

$\frac{3}{4}$ equals $\frac{1}{4}$ of 3, which equals $\frac{1}{4}$ of 30 tenths.

$\frac{1}{4}$ of 30 tenths is 7 tenths, and 2 tenths remaining.

$$4 \overline{) 3.00}$$

2 tenths equals 20 hundredths.

.75

$\frac{1}{4}$ of 20 hundredths is 5 hundredths.

Therefore, $\frac{3}{4}$ equals .75.

Hence, to reduce a fraction to a decimal,

Annex ciphers to the numerator, divide by the denominator, and point off as many decimal places in the quotient as there are ciphers annexed.

399. ANOTHER METHOD : $\frac{3}{4} = \frac{25 \times 3}{25 \times 4} = \frac{75}{100} = .75$

Multiply both terms of $\frac{3}{4}$ by 25 to reduce the fraction to hundredths.

400. Exercise.

Reduce to decimals :

1. $\frac{1}{2}$.

5. $\frac{5}{8}$.

9. $\frac{3}{25}$.

13. $\frac{9}{40}$.

2. $\frac{1}{5}$.

6. $\frac{1}{8}$.

10. $\frac{7}{20}$.

14. $\frac{3}{50}$.

3. $\frac{3}{5}$.

7. $\frac{3}{16}$.

11. $\frac{5}{16}$.

15. $\frac{1}{200}$.

4. $\frac{3}{8}$.

8. $\frac{7}{8}$.

12. $\frac{3}{75}$.

16. $\frac{3}{80}$.

401. Reduce $\frac{5}{8}$ to hundredths ; $\frac{8}{9}$ to thousandths.

$$6 \overline{) 5.00} \\ .83\frac{1}{2}$$

$$9 \overline{) 8.000} \\ .888\frac{8}{9}$$

402. Exercise.

Reduce :

1. $\frac{1}{6}$ to tenths. 3. $\frac{2}{7}$ to hundredths. 5. $\frac{5}{12}$ to thousandths.

2. $\frac{2}{9}$ to tenths. 4. $\frac{7}{12}$ to hundredths. 6. $\frac{2}{3}$ to thousandths.

Addition and Subtraction.

403. Find the sum of 2.7, 25.08, .075, and 27.25.

2.7
25.08
.075
27.25

55.105

Write the numbers so that units of the same order stand in the same column, and add as in addition of whole numbers. Place the decimal point between units and tenths in the sum.

404. Exercise.

Find the sum of :

1.	2.	3.
3.25	1.006	.3048
.0075	.25	2.96
18.2	24.07	.278
<u>.2785</u>	.8	<u>18.075</u>

4. .7, .045, and .62.

5. 3.18, 9.008, and 12.7.

6. .27, 2.55, .0175, and .004.

7. 20.02, 128.025, .07, and .7.

8. 9 tenths, 25 hundredths, and 17 thousandths.

9. 8 and 7 tenths, 12 thousandths, and 4 and 6 hundredths.

10. 7 tenths, 87 hundredths, and 450 thousandths.

11. 16 and 25 ten-thousandths, 7 and 7 thousandths, and 25 hundredths.

12. 105 millionths, 1 and 70 hundred-thousandths, 44 and 125 thousandths, and 1 and 7 tenths.

405. From 12.75 take 7.9.

$$\begin{array}{r} 12.75 \\ 7.9 \\ \hline 4.65 \end{array}$$

From 28.7 take 1.245.

$$\begin{array}{r} 28.700 \\ 1.245 \\ \hline 27.455 \end{array}$$

Write the numbers so that units of the same order stand in the same column, and subtract as in subtraction of whole numbers. Place the decimal point between units and tenths in the difference.

406. Exercise.

1.	3.	5.	7.
From 8.362	2.000	9.2	4
take <u>2.41</u>	<u>1.875</u>	<u>1.075</u>	<u>2.375</u>
2.	4.	6.	8.
From 3.50	3.2	25.6	29.01
take <u>1.27</u>	<u>.75</u>	<u>1.07</u>	<u>11.909</u>

Find the difference between:

9. .8 and .3865.

12. 8.75 and .109.

10. 2 and .0375.

13. 1.09 and .009.

11. 4.010 and .099.

14. 27.4 and .138.

15. 65 hundredths and 75 thousandths.

16. 1 and 9 tenths and 99 hundredths.

17. 109 ten-thousandths and 109 millionths.

18. 5 tenths and 499 thousandths.

Multiplication, Division, and Mensuration.

407. $.3 \times .4 = \frac{3}{10} \times \frac{4}{10} = \frac{12}{100} = .12.$

408. Exercise.

1. Show that $3 \times .4 = 1.2.$

2. Show that $.3 \times 2 = .6.$

3. Show that $.2 \times .3 = .06$.

4. Show that $.3 \times .04 = .012$.

5. Show that $.03 \times .04 = .0012$.

6. In problem 1, how many decimal places are there in the multiplicand? How many in the multiplier? How many in the product?

7. In problem 2, how many decimal places are there in the multiplicand? In the multiplier? In the product?

8. In problem 3, how does the number of decimal places in the multiplicand and multiplier together compare with the number in the product?

9. In each of problems 4, 5, and 6, compare the number of decimal places in the product with the number in the multiplicand and multiplier together.

10. Make a statement about the number of decimal places in the product.

409. Multiply 6.5 by .25.

$$\begin{array}{r}
 6.5 \\
 .25 \\
 \hline
 325 \\
 130 \\
 \hline
 1.625
 \end{array}$$

$$.25 \times 6.5 = \frac{25}{100} \times \frac{65}{10} = \frac{1625}{1000} = 1\frac{625}{1000} = 1.625.$$

From this illustration we see that to multiply decimals, we

Multiply as in whole numbers, and point off as many decimal places in the product as there are in the multiplicand and multiplier together.

410. Multiply .075 by 45; .075 by .45; .000075 by 420.

.075	.075	.000075
<u>45</u>	<u>.45</u>	<u>420</u>
375	375	1500
<u>300</u>	<u>300</u>	<u>300</u>
3.375	.03375	.031500

411. Exercise.

- Multiply:
- | | |
|------------------|---------------------|
| 1. .25 by 7. | 11. 54 by .06. |
| 2. 3.25 by 5. | 12. 4.8 by 7.8. |
| 3. .035 by 9. | 13. .66 by .06. |
| 4. 2.45 by 12. | 14. .32 by 20. |
| 5. .095 by 15. | 15. 1.75 by 240. |
| 6. .075 by 14. | 16. .654 by 2500. |
| 7. 8.36 by 40. | 17. .375 by .0004. |
| 8. .375 by 30. | 18. 100.5 by .25. |
| 9. .508 by 25. | 19. 3.96 by .00256. |
| 10. .0086 by 54. | 20. .879 by 7.56. |

412. Show that: $10 \times .0025 = .025$.

$$\text{SUG. } 10 \times .0025 = 10 \times \frac{25}{10000}$$

$$100 \times .0025 = .25.$$

$$1000 \times .0025 = 2.5.$$

From these illustrations we see that

Moving the decimal point one place rightward multiplies by 10, moving it two places rightward multiplies by 100, moving it three places rightward multiplies by 1000, etc.

413. Oral Exercise.

Read, supplying the missing numbers :

- | | |
|---------------------------|-------------------------------|
| 1. $10 \times .05 = .$ | 10. $1000 \times .075 = .$ |
| 2. $10 \times .025 = .$ | 11. $1000 \times .758 = .$ |
| 3. $10 \times .0075 = .$ | 12. $1000 \times .001 = .$ |
| 4. $100 \times .0025 = .$ | 13. $100 \times 7.5 = .$ |
| 5. $100 \times 2.85 = .$ | 14. $100 \times .0075 = .$ |
| 6. $100 \times .0001 = .$ | 15. $1000 \times .07 = .$ |
| 7. $10 \times 2.5 = .$ | 16. $100 \times .5 = .$ |
| 8. $10 \times 2.56 = .$ | 17. $1000 \times .7 = .$ |
| 9. $100 \times .0075 = .$ | 18. $10000 \times .00002 = .$ |

414. Show that : $2.5 \div 10 = .25$.

$$\text{SUG. } 2.5 \div 10 = \frac{25}{10} \div 10.$$

$$2.5 \div 100 = .025.$$

$$2.5 \div 1000 = .0025.$$

From these illustrations we see that

Moving the decimal point one place leftward divides by 10, moving it two places leftward divides by 100, moving it three places leftward divides by 1000, etc.

415. Oral Exercise.

Read, supplying the missing numbers :

- | | | |
|-----------------------|------------------------|---------------------------|
| 1. $.5 \div 10 = .$ | 8. $.9 \div 100 = .$ | 15. $7 \div 1000 = .$ |
| 2. $.05 \div 10 = .$ | 9. $.27 \div 100 = .$ | 16. $8.4 \div 1000 = .$ |
| 3. $2.5 \div 10 = .$ | 10. $.08 \div 100 = .$ | 17. $75.6 \div 1000 = .$ |
| 4. $.027 \div 10 = .$ | 11. $9.7 \div 100 = .$ | 18. $.01 \div 1000 = .$ |
| 5. $8.5 \div 10 = .$ | 12. $68 \div 100 = .$ | 19. $25 \div 1000 = .$ |
| 6. $.001 \div 10 = .$ | 13. $37 \div 100 = .$ | 20. $.7 \div 1000 = .$ |
| 7. $5 \div 10 = .$ | 14. $4 \div 100 = .$ | 21. $127.5 \div 1000 = .$ |

416. Find the cost of 275 rails at \$6.25 per hundred (C).

$$\begin{array}{r}
 275 = 2.75 \text{ C} \\
 \$6.25 = \text{the cost per C} \\
 \underline{2.75} \\
 3125 \\
 4375 \\
 \underline{1250} \\
 \$17.1875, \text{ or } \$17.19 = \text{the cost of 275.}
 \end{array}$$

Find the cost of 2400 shingles at \$8.25 per thousand (M).

$$\begin{array}{r}
 2400 = 2.400 \text{ M} \\
 \$8.25 = \text{the cost per M} \\
 \underline{2.4} \\
 3300 \\
 1650 \\
 \underline{\hspace{1.5cm}} \\
 \$19.800 = \text{the cost of 2400.}
 \end{array}$$

417. Exercise.

Find the cost of:

1. 600 Havana cigars at \$25 per M.
2. 275 chestnut posts at \$6.50 per C.
3. 385 shad at \$22.50 per C.
4. 2500 cartridges at \$6.50 per M.
5. 3250 gun wads at \$0.45 per M.
6. 225 brass-head nails at \$0.52 per M.
7. 2250 brass paper fasteners at \$0.35 per C.
8. 375 paper bags at \$1.25 per M.
9. 250 envelopes at \$2.25 per M.

10. 1250 tags at \$0.95 per M.

11. 3400 sheets of writing paper at \$3.75 per M.

12. 10 boxes of loaded shells, each containing 25, at \$1.25 per C.

13. 40 packages of letter-heads, each containing 500, at \$1.36 per M.

14. 2275 plastering laths at \$5.50 per M.

$$418. .04 \div 2 = \frac{4}{100} \div 2 = \frac{2}{100} = .02.$$

419. Exercise.

1. Show that $.9 \div 3 = .3$.

2. Show that $.06 \div 3 = .02$.

3. Show that $.12 \div 4 = .03$.

4. Show that $.006 \div 2 = .003$.

5. Show that $.015 \div 3 = .005$.

6. Show that $.112 \div 2 = .056$.

7. In problem 1, how many decimal places are there in the dividend? How many in the quotient?

8. In problems 2 and 3, how many decimal places are there in the dividend? How many in the quotient?

9. In problems 4, 5, and 6, how many decimal places are there in the dividend? How many in the quotient?

Notice that in each of the first 6 problems the divisor is a whole number.

10. In the first 6 problems, how do the number of decimal places in the dividend and in the quotient compare?

420. From the illustration in Art. 419 we see that

When the divisor is a whole number, the number of decimal places in the quotient equals the number in the dividend.

421. Divide 7.75 by 25.

25) 7.75 (.31

$$\begin{array}{r} 75 \\ \underline{25} \\ 25 \\ \underline{25} \end{array}$$

Divide .004 by 25.

25) .00400 (.00016

$$\begin{array}{r} 25 \\ \underline{150} \\ 150 \\ \underline{150} \end{array}$$

422. Exercise.

Divide: 1. .005 by 5.

2. .027 by 9.

3. .0425 by 5.

4. .375 by 15.

5. 8.75 by 25.

6. 4.00 by 25.

7. 25.5 by 15.

8. 6.4 by 16.

9. .0144 by 12.

10. .039 by 13.

11. .03 by 6.

12. .012 by 8.

13. .015 by 25.

14. .004 by 8.

15. .006 by 8.

16. .00252 by 42.

17. .0125 by 25.

18. 191.52 by 42.

19. .0375 by 625.

20. .025 by 16.

423. Divide .008 by .04.

$$.008 \div .04 = \frac{8}{1000} \div \frac{4}{100} = \frac{8}{1000} \times \frac{100}{4} = \frac{8}{10} \div \frac{4}{1} = .8 \div 4.$$

That is, $.008 \div .04 = .8 \div 4$.

From this illustration we see that

Moving the decimal point rightward or leftward

the same number of places in both dividend and divisor does not change the quotient.

424. Divide :

(1) .0625 by .25 ; (2) 6.25 by .0025 ; (3) 6.25 by 2500.

$$(1) .25) .0625 (= 25) 6.25 (25$$

50

125

125

$$(2) .0025) 6.25 (= 25) 62500 (2500$$

50

125

125

00

$$(3) 2500) 6.25 (= 25) .0625 (.0025$$

50

125

125

From these illustrations we see that, in division of decimals, we

Move the decimal point rightward or leftward in both dividend and divisor such a number of places as will make the divisor a whole number not ending in ciphers ; then divide and point off in the quotient as many decimal places as there are in the dividend.

425. Exercise.

- Divide :
- | | |
|--------------------|-------------------|
| 1. .025 by .5. | 11. .02 by .002. |
| 2. .075 by .15. | 12. .5 by .0005. |
| 3. .16 by .04. | 13. .125 by .025. |
| 4. .036 by .06. | 14. 1 by .08. |
| 5. 1.44 by .02. | 15. 1.44 by .036. |
| 6. .048 by .12. | 16. 86.4 by .24. |
| 7. .144 by .012. | 17. 256 by 200. |
| 8. .0375 by .15. | 18. 2.25 by 150. |
| 9. .1728 by .036. | 19. .9 by 360. |
| 10. 30.75 by .075. | 20. 4840 by 16. |

426. In practice the division is seldom carried beyond the fifth decimal place in the quotient, which is usually expressed to the nearest ten-thousandth.

Thus, if the quotient is .76452+, expressed to the nearest ten-thousandth it is .7645. If the quotient is .76456+, expressed to the nearest ten-thousandth it is .7646.

NOTE. The sign + in the above illustration indicates that the quotient expressed is not complete.

427. Exercise.

Express to the nearest ten-thousandth the value of :

- | | |
|---------------------|-------------------------|
| 1. $2.573 \div 6.$ | 6. $1 \div 15.$ |
| 2. $25.37 \div 8.$ | 7. $.8 \div 11.$ |
| 3. $.075 \div 6.$ | 8. $325.5 \div 16.5.$ |
| 4. $37.52 \div 9.$ | 9. $\$375.875 \div 15.$ |
| 5. $.046 \div .06.$ | 10. $\$1000 \div 12.$ |

428. $.25 : 5 = \frac{25}{100} : \frac{5}{10} = \frac{25}{100} : \frac{50}{100} = 25 \div 50$ [§334] = $.25 \div 5$. That is, $.25 : 5 = .25 \div 5$. Hence,

To measure one decimal by another divide the first by the second.

429. Find the value of $.455 : .35$.

$$.455 : .35 = .35 \overline{) .455} \quad (= \quad 35 \overline{) 45.5} \text{ (1.3)}$$

$$\begin{array}{r} 35 \\ \underline{105} \\ 105 \\ \underline{105} \end{array}$$

430. Exercise.

Find the value of :

- | | |
|-------------------|--------------------|
| 1. $.025 : 5$. | 6. $.0036 : 80$. |
| 2. $.049 : .07$. | 7. $.096 : 480$. |
| 3. $7.5 : .15$. | 8. $4.75 : 2.5$. |
| 4. $.27 : 1.8$. | 9. $1 : .125$. |
| 5. $150 : .015$. | 10. $660 : 16.5$. |

431. Oral Exercise.—Miscellaneous Problems.

1. What is $.01$ of $\$5$?

2. Read, supplying the missing numbers:

(a) $1 \div .1 = \cdot$ (c) $100 \times .1 = \cdot$

(b) $1 \div 100 = \cdot$ (d) $.1 \times .1 = \cdot$

3. When $\$5$ is gained on $\$100$, what is gained on $\$1$?

4. $\$12$ is $.01$ of what sum?

5. How long will it take a man to earn $\$12.50$ at $\$1.25$ a day?

6. Read, supplying the missing numbers:

(a) $1 - .2 = .$

(c) $.5 \div 5 = .$

(b) $2 + .08 = .$

(d) $10 \times .5 = .$

7. I bought 4 pounds of coffee at 35 ct. a pound; how much change should I receive from a \$2-bill?

8. If .1 inch in a drawing represents a yard, how many inches will represent 10 yd.?

9. At 1.5 ct. per pound, how many pounds of old iron did a boy sell, if he received 30 ct. for it?

10. Read, supplying the missing numbers:

(a) $2.5 + .05 = .$

(c) $1 - .01 = .$

(b) $50 \div 100 = .$

(d) $5 \div .5 = .$

11. A dealer paid \$25.50 for 5 lambs; how much was that apiece?

12. Does $.1 = .10$? Why?

13. Find the cost of a sheet of 200 two-cent stamps.

14. Does $10 \times .1 = 1$? Why?

15. A man who earns \$2.25 a day and spends \$1 a day saves how much in a week (6 da.)?

16. Does $1 \div 10 = .01$? Why?

432. Exercise—Miscellaneous Problems.

1. A man's store bill for June was \$28.75, for July \$30.68, and for August \$28.75; what was his store bill for the three months?

2. The value of the English pound sterling in U. S. money is \$4.8665; how much less than \$5 is this?

3. The German mark is worth \$0.2385 in U. S. money; how much less than a quarter-dollar is this?

4. Find the amount of the following:

18 lb. Sugar @ 6 ct. per lb. \$

16 lb. Ham @ 18 ct. per lb.

6 lb. Cheese @ 16 ct. per lb.

18 yd. Muslin @ 12 ct. per yd.

\$

5. There are 5.5 yd. in a rod; how many yards are there in a line 28 rods long?

6. A cubic foot of water weighs 62.5 lb., and cork is .24 times as heavy as water; what is the weight of a cubic foot of cork?

7. A farmer sold 128 bu. of oats, which weighed 3904 lb.; how much did these oats weigh to the bushel?

8. What price per hundredweight did a farmer receive for a dressed porker that weighed 3.75 hundredweight and sold for \$24.31?

9. When sugar is selling for \$0.05375 per pound, how many pounds can be bought for \$32.25?

10. A merchant had on hand at the beginning of a day's sales \$60.18. During the day he took in \$79.76, and paid out for produce \$26.10; how much money had he on hand at the close of the day?

433. Exercise—Miscellaneous Problems.

1. What should be charged for 2200 lb. of coal at \$0.32 per 100 lb.?

2. Potatoes are .162 starch; how many pounds of starch are there in a bushel (60 lb.) of potatoes?

3. $.3 + .075 - .0075 = ?$

4. A yard is 36 inches, and a meter is 3.37 inches longer than a yard; how long is a meter?

5. From a thousand take a thousandth.

6. When \$0.06 is charged for the loan of \$1 for 1 year, what should be charged for the loan of \$225 for $1\frac{1}{4}$ years?

7. A cubic foot of water weighs 62.5 lb., and zinc is 7.19 times as heavy as water; what is the weight of a cubic foot of zinc?

8. 7865 plastering laths cost \$31.46; how much was that per M?

SUG. $7865 = 7.865 \text{ M.}$

9. A dealer bought 7000 cigars at \$4.75 per C, and retailed them at 4 for 25 ct.; how much did he gain?

10. Divide 2002 hundred-thousandths by 2 thousandths, and write the result in words.

11. If it costs \$0.08 $\frac{3}{4}$ to ship 100 lb. of wheat, what will it cost to ship 1,250 bu. of wheat, each weighing 60 lb.?

434. Exercise—Miscellaneous Problems.

1. If a laborer's wages are 20 cents an hour, and he works 9 hours on Monday, 10 hours on Tuesday, 12 hours on Wednesday, 11 hours on Thursday, 11 hours on Friday, and 6 hours on Saturday, how much does he earn that week?

2. A man was employed as carrier in the rural free delivery service for a year, for which he was paid \$600. He bought two horses, one for \$125 and the other for \$110, and paid \$15 a month for their feed and other expenses; he also bought a wagon for \$75. His board cost him \$3.50

a week (52 weeks). How much had he clear at the end of the year, if he sold the horses for \$100 each and the wagon for \$25?

3. A father willed \$1250 to each of his two daughters, and twice as much to each of his three sons; to his wife he willed as much as to a son and a daughter; how much did he will to all?

4. Fill in the totals in the following:

	Christians.	Non-Christians.	Total.
Europe.....	340,320,000	12,480,000	
America.....	124,740,000	170,000	
Australia.....	3,800,000	
Asia and Africa..	7,240,000	641,550,000	
Total.....			

5. Which is nearer to a million dollars, and by how much, \$1,200,000, or \$889,008?

6. I owed a man a debt of \$220 and gave him 16 5-dollar bills; how many 10-dollar bills must I give him to pay the balance?

7. A traveler has gone 1220 miles of a journey, which is $\frac{2}{5}$ of the distance he has yet to go; how long is his journey?

435. Exercise—Miscellaneous Problems.

1. A miller bought 46520 lb. of wheat at \$0.80 per bushel (60 lb.); find the cost.

2. A laborer worked for a merchant at \$1.25 a day for 205 days. He bought from the merchant a suit of clothes for \$14.75, a pair of shoes for \$2.75, and groceries to the

amount of \$38.05. The balance was paid in cash; how much cash was paid?

3. How many bushels of clover seed at \$6.75 per bushel can be bought for \$1000?

4. A farmer bought 6 steers at \$30 a head, and after feeding them 4 months at a cost of \$35 a month, sold them for \$410; find the average gain per head.

5. The sum of two numbers is 27000; if the larger of the two numbers is 17538, what is their difference?

6. $324 + 4679 + ? + 389 + 64 + 4642 = 16555$.

7. Find the decrease in 20 years in each of the following prices of farm implements:

Implements.	1880.	1900.	Decrease.
Mowers	\$65.00	\$40.00	
Corn planters, hand.....	1.25	1.00	
Plows, walking, steel.....	15.00	10.67	
Plows, shovel.....	4.00	2.50	
Pumps, wooden.....	8.00	4.00	
Rakes, sulky.....	25.00	14.00	
Seeders, 2-horse.....	35.00	25.00	
Scythes.....	.80	.60	
Shellers, corn.....	6.00	2.40	
Sleighs.....	25.00	18.00	
Stackers, hay.....	55.60	40.00	
Wagons, farm.....	90.00	57.00	
Hay carriers.....	10.00	3.50	
Churns.....	7.30	5.33	
Cultivators, walking, 2-horse..	20.00	13.00	
Potato diggers.....	20.00	10.00	
Corn drills	12.00	8.00	
Grain drills	50.00	30.00	
Horse hay forks.....	3.50	1.00	
Harrows.....	15.00	10.00	
Potato hillers.....	12.00	8.00	
Fanning mills.....	35.00	20.00	
Harvesters, twine binders....	325.00	120.00	
Harvesters, combined.....	110.00	65.00	

436. Exercise—Miscellaneous Problems.

1. A society rented a hall for \$25 and paid \$17.50 to advertise a lecture. They sold 128 tickets at \$1 each, 326 at 75 cents each, and 122 at 50 cents each. How much did they clear, if they paid the lecturer \$150?

2. From $\frac{2}{3}$ of the sum of 1905 and 995 subtract twice the difference between 701 and 599.

3. A congregation wishes to raise a fund of \$10000. 4 men gave \$1250 each, 2 men \$250 each, and two collections amounted to \$795 and \$356 respectively; how much must yet be raised?

4. If a man pays 5 cents for the use of \$1 for 1 year, how much must he pay for the use of \$500 for 3 years?

5. If 5 cents is paid for the use of \$1, how many dollars should a man have the use of if he pays \$20?

6. A dealer bought 6 cans of lard which weighed 261 pounds; the empty cans weighed 9 pounds. How many pounds of lard were there in each can, if the cans were of equal size?

CHAPTER IV.

DENOMINATE AMOUNTS.

437. Denominate Units are units established by custom or law to measure value, weight, time, length, surface, solids, capacity, etc.

Thus, *a dollar, a pound, a day, a yard*, etc., are denominate units.

United States Money.

438. The standard unit of value in the United States is the DOLLAR.

TABLE.

10 mills (m.)	= 1 cent (ct.).
10 cents	= 1 dime (d.).
10 dimes	= 1 dollar (\$).
10 dollars	= 1 eagle (E.).

The coins of the United States, now authorized by law, are:

<i>Gold.</i>	<i>Silver.</i>	<i>Nickel.</i>	<i>Bronze.</i>
Double-Eagle,	Dollar,	Five Cents.	One Cent.
Eagle,	Half-Dollar,		
Half-Eagle,	Quarter-Dollar,		
Quarter-Eagle.	Dime.		

NOTE 1. Any number of mills less than 10 may be expressed

by writing the figure in the third place to the right of the decimal point.

Thus, 5 *mills* may be expressed \$0.005.

NOTE 2. In the settlement of business transactions, it is customary to omit any number of mills less than 5, and to regard 5 mills or more as 1 cent.

NOTE 3. \$4.8665 = 1 pound (£), the unit of value in English money.

\$0.193 = 1 franc, the unit of value in French money.

\$0.2385 = 1 mark, the unit of value in German money.

439. Oral Exercise.

1. How many mills are there in 3 ct.? 5 ct.? 1d.? \$1?
2. How many mills are there in $\frac{1}{2}$ ct.? $\frac{1}{6}$ ct.? $\frac{1}{4}$ ct.? $1\frac{1}{2}$ ct.?
3. How many cents are there in 3d.? 6d.? 8d.? 10d.?
4. How many cents are there in $\$ \frac{1}{2}$? $\$ \frac{1}{4}$? $\$ \frac{3}{4}$? $\$ \frac{3}{8}$?
5. How many cents are there in $\$ \frac{1}{8}$? $\$ \frac{3}{8}$? $\$ \frac{5}{8}$? $\$ \frac{7}{8}$?
6. How many dollars are there in 200 ct.? 500 ct.? 100 ct.? 300 ct.?
7. How many dimes should be given in exchange for a half-dollar?
8. How many 5-cent pieces must be given for a quarter-dollar?
9. What decimal part of a dollar is 2d.? 7d.? 3ct.? 5d.?
10. A boy has a dollar in 5-cent pieces; how many coins has he?

11. A mill is what part of a cent?
12. A cent is what part of a dollar?
13. A mill is what part of a dollar?
14. How many $\$2\frac{1}{2}$ gold pieces must be given in exchange for an eagle?
15. The gold coins mentioned in § 438 have together what value?
16. The silver coins mentioned in § 438 have together what value?
17. How many pieces of money has a boy who has $\$2\frac{1}{2}$ in quarter-dollars and 50 ct. in dimes?

440.

PAPER.

- 24 sheets = 1 quire.
 20 quires = 1 ream.
 2 reams = 1 bundle.
 5 bundles = 1 bale.

441.

COUNTING.

- 12 units = 1 dozen (doz.).
 12 dozen = 1 gross (gro.).
 12 gross = 1 great gross (G. gro.).
 20 units = 1 score.

442. Oral Exercise.

1. How many units are there in 6 doz.? $\frac{3}{4}$ doz.? $1\frac{1}{2}$ doz.? $2\frac{1}{2}$ doz.?
2. How many units are there in 3 score? 2 gro.?
3. How many sheets of paper are there in 2 quires? $\frac{1}{2}$ quire?

4. A boy bought a gross of matches for 60 ct., and sold them at 1 ct. a box; find his gain.

5. What should be paid for 8 eggs at 24 ct. per dozen?

6. 6 eggs out of 4 dozen were broken; how many remained?

7. When lemons are selling at the rate of 3 for 10 ct., how much is that a dozen?

8. When eggs are selling at 24 ct. per dozen, how much should be charged for a score?

9. When matches are selling at 3 boxes for 5 ct., how much should be paid for 1 dozen boxes?

443. Exercise.

1. When matches are selling at 6 boxes for 25 ct., how much are they per gross?

SUG. A gross is how many times 6?

2. How many dozen crayons are there in 5 boxes, each containing a gross?

3. 10 eggs weigh about 1 pound; find the weight of 20 doz. eggs.

Find the gain on:

4. 8 doz. note-books, bought at \$1.60 per doz. and sold at 15 ct. each.

5. 3 doz. rulers, bought at 50 ct. per doz. and sold at 5 ct. each.

6. 4 gro. erasers, bought at \$3.20 per gro. and sold at 5 ct. each.

7. 2 gro. pencils, bought at \$3.00 per gro. and sold at 2 for 5 ct.

8. 2 reams water-color paper, bought at \$20 per ream, and sold at 5 ct. per sheet.

9. 5 reams drawing paper, bought at 35 ct. per ream and sold at 3 sheets for 1 ct.

10. 1 quire blotters, bought at 60 ct. and sold at 3 ct. each.

11. 2 M envelopes, bought at \$1.30 per M and sold at 25 for 5 ct.

Bills and Accounts.

444. A **Bill** is a written statement of the names, quantities, and prices of goods sold or services rendered, together with the names of the parties and the date of the transaction.

445. An **Account** is a record of business transactions between two parties at a given date.

446. The **Debtor** (Dr.) is the party who buys the goods or receives the service.

447. The **Creditor** (Cr.) is the party who sells the goods or renders the service.

448. A **Debit** (Dr.) is an entry in a bill or an account against the debtor.

449. A **Credit** (Cr.) is an entry in a bill or an account in favor of the debtor.

450. An **Item** is any separate debit or credit made in a bill or an account.

451.

A RECEIPTED BILL.

WEST CHESTER, PA., Jan. 20, 1903.

James Hunter,

Bought of THOMAS HOAG.

6 lb. Coffee	35¢	2	10		
2 lb. Tea	70¢	1	40		
12 lb. Sugar	5¢		60	4	10
Received Payment, Thomas Hoag.					

452.

AN ACCOUNT.

FALSINGTON, PA., June 15, 1903.

Henry Stackhouse,

In account with C. D. BEANS & CO.

<i>Dr.</i>					
16 yd. Muslin	\$0.12	1	92		
15 lb. Sugar	.05		75		
20 yd. Carpet	.80	16	00	18	67
<i>Cr.</i>					
15 doz. Eggs	\$0.24	3	60		
18 lb. Butter	.25	4	50		
20 lb. Sausage	.12	2	40	10	50
Balance,				8	17

453. Exercise.

1. Extend the items in the following bill and find the total:

CLEVELAND, OHIO, September 15, 1903.

Mr. Samuel Martin,

Bought of ROSS MILLER.

4 boxes Raisins	\$3.20				
1 doz. cans California Apricots	5.50				
6 25-lb. boxes Prunes	.06½				
5 crates Jersey Cranberries	2.50				
Received Payment,					

2. Extend the items in the following account and find the balance:

BALTIMORE, MD., April 1, 1904.

Jacob M. Frantz,

In account with STEINMAN & CO.

Dr.					
1 Gasoline Stove		4	45		
1 Kettle and Steamer		2	00		
2 Preserving Kettles	\$0.75				
½ doz. Bread Pans	3.20				
Cr.					
2 bu. Timothy Seed	\$2.75				
3 bu. Seed Potatoes	.80				
1 bu. Seed Corn	.75				
Balance,					

3. Sept. 1, 1903, Harry Watson presents to you the following bill for labor: 10 days carpentering, \$2.50 per day; 8 days painting, \$3 per day; 4 days roofing, \$2.75 per day; 3 days common labor, \$1.25 per day. Write the bill and find the amount due.

4. Oct. 1, 1903, James Wilson bought of Hiram Leonard, Pittsburg, Pa., 40 bbl. Winter Superfine Flour @ \$2.80 per bbl.; 12 bbl. Winter Extra Flour @ \$3 per bbl.; 14 bbl. Penna. Roller Flour @ \$3.25 per bbl. At the same time Mr. Leonard bought from James Wilson 80 bu. No. 2 Red Wheat @ 80 ct. per bu.; 60 bu. Corn @ 55 ct. per bu.; 50 bu. Oats @ 43 ct. per bu. Make out the account and find the balance due.

Measures of Time.

454. There are two principal units of time, the DAY and the YEAR.

TABLE.

60 seconds (sec.)	= 1 minute (min.).
60 minutes	= 1 hour (hr.).
24 hours	= 1 day (da.).
7 days	= 1 week (wk.).
52 weeks	= 1 year (yr.), nearly.
365 days	= 1 common year.
366 days	= 1 leap year.
100 years	= 1 century.

The week consists of 7 days of which the names are as follows: *Sunday, Monday, Tuesday, Wednesday, Thursday, Friday, Saturday.*

The year is divided into 12 calendar months, as follows:

Names.	Number of Days.	Names.	Number of Days.
January	31	July	31
February	28 or 29	August	31
March	31	September	30
April	30	October	31
May	31	November	30
June	30	December	31

NOTE 1. A CENTENNIAL YEAR is one whose number is divisible by 100.

Thus, 400, 1800, and 1900 were centennial years.

NOTE 2. Centennial years whose number is divisible by 400, and other years whose number is divisible by 4, are LEAP YEARS.

Thus, 1600, 1896, and 1904 were leap years.

NOTE 3. A.M. stands for *forenoon*; P.M. stands for *afternoon*; 7.45 P.M. means 45 *minutes past* 7 P.M.

455. Oral Exercise.

1. The winter months are December, January, and February; how many days are there in the winter months?

2. A family that uses 2 qt. of milk a day spends how much for milk during March, the cost of the milk being 5 ct. a quart?

3. Name the 7th day of the week; the 5th; the 2d; the 1st; the 4th; the 3d; the 6th.

4. Name the months that have 30 days.

5. When a pulse beats 18 times in 15 seconds, how many times does it beat in a minute?

6. A building was erected in MDCCCXC; how many years ago was that?

7. Name the months that have 31 days.
8. One coin is dated 1880, another 1903; how many years are there between their dates?
9. Name the 11th month; the 4th; the 7th; the 12th; the 8th; the 3d; the 6th; the 1st; the 9th; the 2d; the 5th; the 10th.
10. Name the Roman letters that are used to write the numbers of the present year.
11. At 20 ct. an hour, how much will a motorman earn from 6 A.M. to 2 P.M.?
12. How much rent was paid in 1 yr. 6 mo. for a house that rented for \$20 a month?
13. When a hotel is charging 50 ct. a meal and \$1 for lodging, how much is it charging per week at the same rate?

Measures of Capacity.

DRY MEASURE.

456. The standard unit of dry measure is the BUSHEL.

TABLE.

2 pints (pt.)	= 1 quart (qt.).
2 quarts	= 1 small measure.
8 quarts	= 1 peck (pk.).
4 pecks	= 1 bushel (bu.) stricken measure.
5 pecks	= 1 heaped bushel, nearly.

LIQUID MEASURE.

457. The standard unit of liquid measure is the GALLON.

TABLE.

4 gills (gi.)	= 1 pint (pt.).
2 pints	= 1 quart (qt.).
4 quarts	= 1 gallon (gal.).
$31\frac{1}{2}$ gallons	= 1 barrel (bbl.).
2 barrels	= 1 hogshead (hhd.) = 63 gal.

458. Oral Exercise.

1. How many pints are there in 3 qt.?
2. How many pints are there in a gallon?
3. How many quarts are there in $\frac{1}{2}$ gal.?
4. How many quarts are there in 3 pk.?
5. How many quarts are there in a bushel?
6. How many quarts are there in $\frac{1}{2}$ pk.?
7. When apples are selling at 10 ct. a half peck, how much are they a bushel?
8. A farmer bought a peck of grass seed for \$0.60; how much was it a bushel?
9. What should be paid for 3 qt. of vinegar at 16 ct. a gallon?
10. How many half-pint blocks can be made from a gallon of ice cream?
11. A family that uses 1 qt. of milk each week day and 2 qt. on Sunday, uses how many gallons a week?
12. A trucker put 1 bu. of berries into 2-qt. boxes; how many boxes were required?
13. How many gill bottles are required to hold a quart of alcohol?
14. When potatoes are selling at 80 ct. per bushel, what should be charged for $\frac{1}{2}$ pk.?

Measures of Weight.

AVOIRDUPOIS WEIGHT.

459. Avoirdupois weight is used for weighing all substances except those weighed by Troy weight, medicines in prescription, diamonds, and pearls. The standard unit is the AVOIRDUPOIS POUND.

TABLE.

16 ounces (oz.)	= 1 pound (lb.).
25 pounds	= 1 quarter (qr.).
4 quarters	= 1 hundredweight (cwt.).
20 hundredweight	= 1 Ton (T.).

NOTE 1. 1 lb. avoirdupois = 7000 Troy grains.

NOTE 2. The long hundredweight, 112 pounds, and the long ton, 2240 pounds, are used in custom houses and in some wholesale and retail transactions.

Thus, coal in Pennsylvania is bought and sold by the long ton.

460. The following table gives the weight of a bushel of various grains, seeds and other produce :

TABLE.

	<i>Lb.</i>		<i>Lb.</i>		<i>Lb.</i>
Barley	48	Corn (shelled)	56	Potatoes	60
Beans	60	Corn (on cob)	70	Rye	56
Buckwheat	48	Clover seed	60	Timothy seed	45
Bran	20	Oats	32	Wheat	60

NOTE. 196 lb. is the weight of 1 barrel of flour.

200 lb. is the weight of 1 barrel of beef or pork.

100 lb. is the weight of 1 keg of nails.

TROY WEIGHT.

461. Troy weight is used in weighing gold, silver, platinum, and jewels, except precious stones. The standard unit is the TROY POUND.

TABLE.

24 grains (gr.) = 1 pennyweight (pwt.).

20 pennyweights = 1 ounce (oz.).

12 ounces = 1 pound (lb.).

NOTE 1. The unit of weight for precious stones is the CARAT, which equals 4 diamond grains, or about $3\frac{1}{2}$ Troy grains. Pearls are sold by the diamond grain.

NOTE 2. 412.5 gr. is the weight of a silver dollar.

462. Oral Exercise.

1. What should 4 oz. of cheese cost at 16 ct. per pound?
2. How many more pounds are there in a long ton than in a short ton?
3. What should 1000 lb. of hay cost at \$18 per ton?
4. How many 200-lb. sacks of fertilizer will make a ton?
5. What part of a pennyweight is 8 gr.?
6. How much should $\frac{1}{2}$ bu. of wheat weigh?
7. How much should a peck of potatoes weigh?
8. How many bales of hay, each weighing 4 hundred-weight, will weigh a ton?
9. What will $\frac{1}{4}$ lb. of spices cost at 2 ct. an ounce?

10. What will 1 lb. 12 oz. of dried beef cost at 24 ct. per pound?

11. 6 pieces of silverware, each weighing 4 oz., weigh how many pounds?

12. How many grains of gold are there in a piece of jewelry weighing 2 pwt., if it is $\frac{3}{8}$ pure gold?

13. Find the weight of 2 bu. of oats.

463. Find the cost of 4500 lb. of hay at \$18.75 per ton.

$$4500 \text{ lb.} = 4.500 \text{ M lb.} = 2.25 \text{ T.}$$

$$\$18.75 = \text{the cost per T.}$$

$$\begin{array}{r} 2.25 \\ \hline \end{array}$$

$$9375$$

$$3750$$

$$\begin{array}{r} 3750 \\ \hline \end{array}$$

$$\$42.1875, \text{ or } \$42.19 = \text{the entire cost.}$$

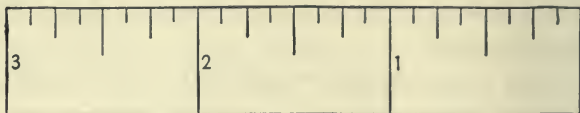
464. Exercise.

Find the cost of:

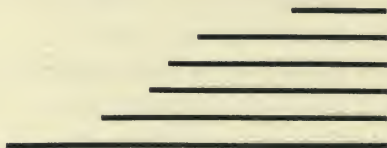
1. 1875 lb. of bran at \$18 per ton.
2. 3880 lb. of straw at \$6.25 per ton.
3. 4665 lb. of fertilizer at \$14 per ton.
4. 1840 lb. of hay at \$18.25 per ton.
5. 3250 lb. of mixed feed at \$20.25 per ton.
6. 8560 lb. of phosphate at \$18 per ton.
7. 10756 lb. of iron ore at \$5.78 per ton.
8. 278 lb. of bran at \$18.50 per ton.
9. 3425 lb. of old iron at \$20 per ton.
10. 4596 lb. of coal at \$5.75 per ton.

Measures of Length.

465. Exercise.



1. How many inches long is this rule?
2. How many half inches are there in each inch?
3. How many half inches are there in 2 inches? in 3 inches?
4. How many quarter inches are there in each inch?
5. How many quarter inches are there in 2 inches? in 3 inches?
6. How many eighth inches are there in each inch?
7. How many eighth inches are there in 2 inches? in 3 inches?
8. How many half inches are there in $1\frac{1}{2}$ inches? in $2\frac{1}{2}$ inches?
9. How many quarter inches are there in $1\frac{1}{4}$ inches? in $1\frac{3}{4}$ inches?
10. Measure these lines and state how many inches long each is.



11. Draw a line $1\frac{3}{4}$ inches long.

12. Draw a line 12 inches long.

12 inches make a foot.

13. Draw a line 1 foot 6 inches long. How many inches long is it?

14. How many inches are there in a half foot? In $1\frac{1}{4}$ ft.?

15. What part of a foot is 6 inches?

16. What part of a foot is 4 inches?

17. What part of a foot is 3 inches?

18. Measure this line.

How long is it? How long is each part of it?

19. Let each part represent a foot; how many feet does the whole line represent?

3 feet make a yard.

20. What does the line above represent?

21. How many feet are there in half a yard?

22. How many inches are there in a yard?

23. How many inches are there in half a yard?

24. How many inches are there in $\frac{1}{4}$ yard? in $\frac{3}{4}$ yard?

25. How many inches are there in $\frac{2}{3}$ yard? in $\frac{5}{6}$ yard?

26. What part of a yard is a foot?

27. What part of a yard is 2 feet?

28. What part of a yard is 6 inches?

29. What part of a yard is 4 inches?

466. The standard unit of length is the YARD.

TABLE.

12 inches (in.) = 1 foot (ft.).

3 feet = 1 yard (yd.).

$5\frac{1}{2}$ yards = 1 rod (rd.).

320 rods = 1 statute mile (mi.).

467. OTHER MEASURES OF LENGTH.

A FATHOM = 6 feet, used to measure the depth of the sea.

A HAND = 4 inches, used in measuring a horse's height.

A GEOGRAPHIC MILE, or Knot = 6086 ft.

A LEAGUE (England and U. S.) = 3 geographic miles, used to measure distances at sea.

A CHAIN = 4 rd., used by surveyors in measuring land.

468. Oral Exercise.

1. How many inches long is a 2-foot rule?
2. How many 18-in. ropes can be made from a rope 6 ft. long?
3. How many yards are there in 3 rd.?
4. How many inches are there in a $\frac{1}{2}$ -ft. rule?
5. The ocean at a certain point is 20 fathoms deep; how many feet is that?
6. A horse that is $14\frac{1}{2}$ hands high is how many inches high?
7. How many feet are there in 36 inches?
8. 4 inches is what part of a foot?
9. What is the distance around a room 24 ft. long and 18 ft. wide?
10. A rule $1\frac{1}{2}$ ft. long was marked off in inches; how many inches were marked off?
11. A boy's hoop in turning 3 times passes over 10 ft.; what is the distance around it?

12. How many feet are there in a rod?

13. How many feet high is a horse that is 15 hands high?

469. Oral Exercise—Miscellaneous Problems.

Read, supplying the missing numbers :

1. .5 of 18 = .

2. $2480 \div 8 =$.

3. $\frac{4}{5}$ of 100 = .

4. $8 = \frac{4}{5}$ of .

5. $2\frac{1}{2} + 4\frac{1}{2} =$.

6. \$1 - 87 ct. = — ct.

7. 35 ct. + . = \$1.

8. 4000 lb. = — tons.

9. 28 da. = — weeks.

10. $1\frac{1}{2}$ yd. of cloth at 18 ct. per yard cost — ct.

11. .25 of 244 = .

12. 200 shad at \$20 per C cost —.

13. 3000 cigars at \$30 per M cost —.

14. 3000 lb. of hay at \$18 per T. cost —.

15. 1.5 ft. = — of a yard.

16. $2 \div 100 =$.

17. \$20 - 25 ct. = .

470. Exercise—Miscellaneous Problems.

1. If chestnuts are bought at \$2.40 a bushel and sold at 5 ct. a pint, find the gain on a bushel.

2. How many seconds are there in an hour ?

3. When vinegar is retailed at 3 ct. per quart, how much is received for a barrel containing 36 gal. ?

4. A dealer wishes to sell apples that cost him \$1.20 per bushel so as to double his money; how much must he charge per peck?

5. How many hours are there in October?

6. What should be paid per bushel for oats that weigh only 28 lb. to the bushel, when oats are quoted at 36 ct. per bushel (32 lb.)?

7. In \$7.50, how many dimes are there? How many cents?

8. At 15 ct. per cwt., find the cost of shipping a machine weighing 3250 lb.

9. How many minute spaces does the minute hand of a clock pass over in a day?

10. How many bottles, each holding a gill, can be filled from a gallon of ink?

11. A clock that strikes the hours, strikes how many times a day?

12. A dealer put 3 pk. of peanuts into pint packages; how many packages had he?

13. If $\frac{1}{2}$ bu. of oats weighs $14\frac{1}{2}$ lb., how much too light are these oats per bushel?

14. A ship was sunk in 80 fathoms of water; how many feet was that?

15. Show that a mile contains 1760 yd.

16. Find the cost of the fertilizer needed for 6 acres of land, if 400 lb. are sowed to the acre, and it costs \$14 per ton.

17. A miller bought 9546 lb. of corn at 60 ct. a bushel; how much did he pay for it?

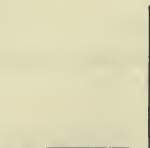
18. When bran is selling for \$24 per ton, how many pounds should be given for \$15 ?
19. $4\frac{1}{2}$ bu. of wheat make a barrel of flour ; how many pounds of flour does 1 bu. of wheat make ?
20. How many 2-grain quinine pills can be made from a pound (avoir.) of quinine ?
21. A farmer's wheat crop weighs 16515 lb. ; how much is it worth at 80 ct. a bushel ?
22. What should be charged for a sack of flour weighing $24\frac{1}{2}$ lb., when flour is selling at \$4.80 a barrel ?
23. Show that a mile contains 5280 ft.
24. What years since 1890 have been leap years ?
25. A surveyor's chain contains 100 links, each 7.92 in. long ; how many feet long is the chain ?
26. How many days are there from June 1 to Sept. 15 ?
SUG. Count Sept. 15 but not June 1.
27. How many days are there from June 15 to Dec. 31 ?
28. What date is 60 da. after Apr. 20 ?

Measures of Surface.

471. The opening between two lines that meet is called an **Angle**.



Acute Angle



Right Angle



Obtuse Angle

472. Anything that has length and breadth without thickness is called a **Surface**.



A Square.

473. A Square is a surface that has four equal sides and four right angles.

474. Exercise.

1. Which is larger, an acute angle or a right angle? A right angle or an obtuse angle? An acute angle or an obtuse angle?

2. Draw an acute angle; an obtuse angle; a right angle.

3. Draw a square 2 inches long.

4. Draw a square 3 inches long.

5. Draw a square $\frac{1}{2}$ inch long.

475. Exercise.

1. Measure the length and the width of the square above. How long is it? How wide?

A square one inch long and one inch wide is a Square Inch (sq. in.).

2. Draw a square inch.

3. How long is square ABCD? How wide?

4. What is the distance around it?

5. How many square inches does it contain?

6. How many sides has a square?



7. How do the sides compare in length ?
8. Draw a square 1 foot long and 1 foot wide.

A square one foot long and one foot wide is a Square Foot (sq. ft.).

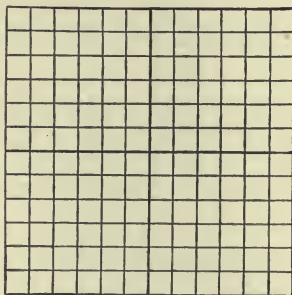
Here is a drawing representing a square foot divided into square inches.

9. How many square inches are there in 1 row ?

10. How many rows of square inches are there ?

11. How many square inches are there in a square foot ?

12. How many inches long are the four sides of a square foot ?



13. How long is $\frac{1}{4}$ of a square foot ?

14. How many inches is it around $\frac{1}{4}$ of a square foot ?

15. How many square inches are there in $\frac{1}{4}$ of a square foot ?

16. How many square inches are there in $\frac{3}{4}$ of a square foot ?

17. How many square inches are there in $\frac{1}{2}$ of a square foot ?

18. How many square inches are there in $\frac{1}{12}$ of a square foot ?

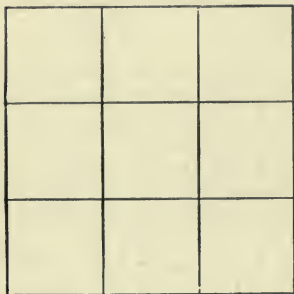
What part of a square foot is :

- | | | |
|----------------|----------------|-----------------|
| 19. 12 sq. in. | 22. 48 sq. in. | 25. 96 sq. in. |
| 20. 24 sq. in. | 23. 60 sq. in. | 26. 108 sq. in. |
| 21. 36 sq. in. | 24. 72 sq. in. | 27. 120 sq. in. |

476. Oral Exercise.

A square one yard long and one yard wide is a Square Yard (sq. yd.).

1. How many feet long is a square one yard long?
2. How many feet wide is a square one yard wide?



This drawing represents a square yard divided into square feet. It is drawn on the scale of half an inch to the foot.

3. What does each small square represent?

4. How many square feet are there in each row?

5. How many rows are there?

6. How many square feet are there in a square yard?

7. How many square feet are there in $\frac{1}{3}$ of a square yard?

8. How many square feet are there in $\frac{2}{3}$ of a square yard?

9. What part of a square yard is 1 sq. ft.? 3 sq. ft.? 6 sq. ft.?

70. How many square feet are there in 2 square yards?

477.**TABLE.**

144 square inches (sq. in.) = 1 square foot (sq. ft.).

9 square feet = 1 square yard (sq. yd.).

30 $\frac{1}{4}$ square yards = 1 square rod (sq. rd.).

160 square rods }
10 square chains } = 1 acre (A.).

640 acres = 1 square mile (sq. mi.).

NOTE. A square rod is also called a PERCH.

478. Exercise.

1. Draw a 2-inch square.

NOTE. By a 2-inch square is meant a square 2 in. long and 2 in. wide.

2. Divide the 2-in. square into square inches. How many square inches are there in 1 row? How many rows are there? How many square inches in the square?

3. Draw a 3-in. square and find how many square inches it contains.

4. Draw a square inch and divide it into 4 equal squares.

5. How long is each part? How wide?

6. A square half an inch long and half an inch wide is what part of a square inch?

7. Draw a square 4 inches long and 4 inches wide.

8. How many square inches are there in a 4-in. square?

9. How many square feet are there in a square 5 ft. long and 5 feet wide?

10. How many square feet are there in a square 6 ft. long and 6 feet wide?

11. How many square yards are there in a square 2 yd. long and 2 yd. wide?

12. Draw a square $5\frac{1}{2}$ in. long and $5\frac{1}{2}$ in. wide. Find the number of square inches in this square.

13. If each inch of the square mentioned in problem 12 represents a yard, how long is the square? How wide? How many square yards in it?

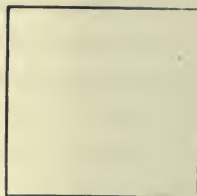
14. How many yards long is a square rod? How many yards wide?

15. How many square yards are there in a square rod?

16. How many square yards are there in 4 sq. rd.?

479. Exercise.

This drawing represents a square 20 rd. long and 20 rd. wide.



20 rd.

1. How many squares each 1 rd. long could be placed along one side of this square?

2. How many rows of such squares could be placed in the whole square?

3. How many such squares would this square contain?

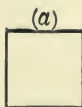
4. What must be multiplied together to give the number of square rods in this square?

5. How many square rods are there in an acre?

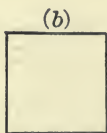
6. What part of an acre is represented by this square?

7. How many square rods are there in a square 6 rd. long and 6 rd. wide?

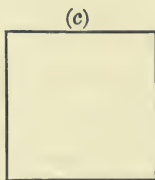
8. How many acres are there in each of these squares?



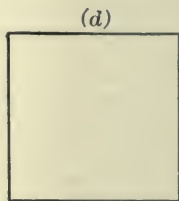
40 rd.



60 rd.



80 rd.

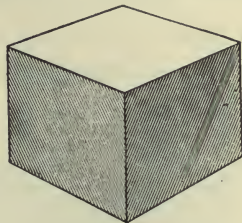


90 rd.

Cubic Measure.

480. Anything that has length, breadth, and thickness is a **Solid**.

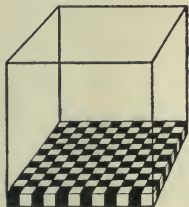
481. A **Cube** is a solid bounded by six equal squares.



A Cube.

482. Oral Exercise.

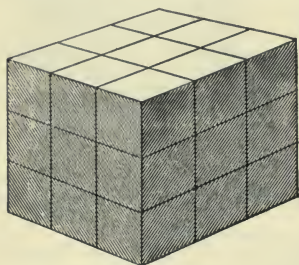
1. How many edges of this figure can you see? How many faces?
2. How many edges of this figure can you not see? How many faces?
3. How many edges has this figure? How many faces?
4. Measure the length of each edge that you can see. Are the edges equal?
5. What is the name of this figure?
6. When a cube is an inch long, an inch wide, and an inch high, what is it called?
7. If each edge of this cube were a foot long, what would the cube be called?
8. If each edge of this cube were a yard long, what would the cube be called?

**483. Oral Exercise.**

This figure represents a cubic foot with one layer of cubic inches in it.

1. How many cubic inches are there in 1 row of this layer?
2. How many rows of cubic inches are there in this layer?

3. How many cubic inches are there in this layer?
4. How many inches high is a cubic foot?
5. How many layers of cubic inches can be placed in a cubic foot?
6. How many cubic inches are there in a cubic foot?



This figure represents a cubic yard divided into cubic feet.

7. How many cubic feet are there in one row of the upper layer?
8. How many rows of cubic feet are there in the upper layer?
9. How many cubic feet are there in the upper layer?
10. How many layers of cubic feet are there in the cube?
11. How many cubic feet are there in a cubic yard?

484.

TABLE.

1728 cubic inches (cu. in.) = 1 cubic foot (cu. ft.).

27 cubic feet = 1 cubic yard (cu. yd.).

485.

IMPORTANT FACTS.

1 gallon = 231 cu. in.

1 bushel = 2150.42 cu. in.

1 bushel = $1\frac{1}{4}$ cu. ft. nearly.

$62\frac{1}{2}$ lb. = the weight of 1 cu. ft. of water.

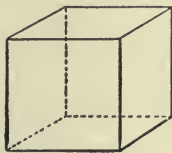
$24\frac{3}{4}$ cu. ft. = 1 perch of masonry.

486. Oral Exercise.

1. How many cubic feet are there in 2 cu. yd.?
2. How many cubic feet are there in $\frac{2}{3}$ cu. yd.?
3. What part of a cubic yard is 9 cubic feet?
4. What part of a cubic yard is 18 cubic feet?
5. How many cubic feet are there in a bin that will hold 4 bu.? [§ 485.]
6. How many cubic feet are there in a bin that will hold 10 bu.?
7. A bin containing 20 cu. ft. will hold how many bushels?

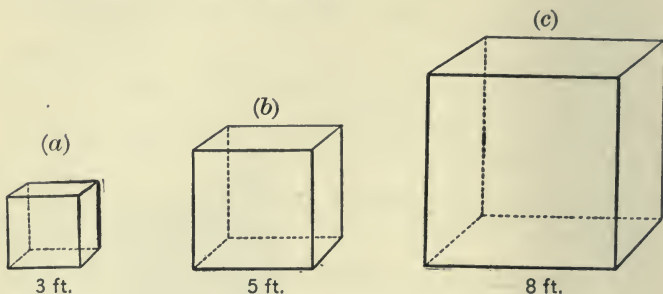
487. Exercise.

This drawing represents a cube 5 in. long, 5 in. wide, and 5 in. high.

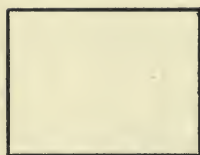


1. How many cubic inches could be placed in this cube along one edge? How many rows would make one layer of cubic inches in the cube? How many such layers could be placed in the cube? How many cubic inches would this cube make? What did you multiply together to get the number of cubic inches the cube would make?
2. How many cubic inches are there in a cube 6 in. long?
3. Draw a cube 2 in. long and find the number of cubic inches in it.
4. How many cubic feet are there in a cube 2 ft. long?
5. How many cubic yards are there in a cube 4 yd. long?

6. Find the number of cubic feet in each of the cubes represented by these drawings:



Rectangles.



Rectangle

488. A Rectangle is a surface that has four sides and four right angles.

The opposite sides of a rectangle are equal.



489. Exercise.

ABCD represents a rectangle 4 in. long and 3 in. wide, divided into square inches.

1. How many square inches are there in one row of ABCD? How many rows are there in ABCD? How many square inches?

2. What numbers did you multiply together to get the number of square inches in rectangle ABCD?

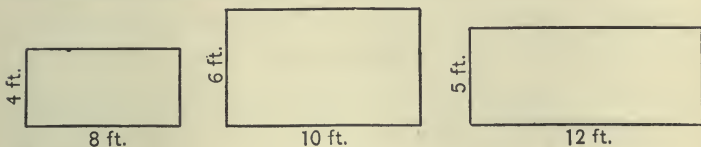
3. If each square in ABCD were a square foot, how

long would ABCD be? How wide? How many square feet would it contain?

4. Draw a rectangle 5 in. long and 2 in. wide, divide it into square inches, and find how many square inches there are in it.

5. Draw a rectangle 4 in. long and $\frac{1}{2}$ in. wide, and find how many square inches it contains.

6. Find how many square feet there are in each of the rectangles represented here :



490. Find the number of square inches in a window pane 10 in. long. and 8 in. wide.

10 = the number of inches in the length of the pane.

8 = " " " " " " width " " "

$\therefore 8 \times 10$, or $80 =$ " " " square inches in the pane.

NOTE. The sign \therefore is read *therefore*.

491. Exercise.

1. How many square feet of boards are there in a floor 12 ft. long and 9 ft. wide?

2. How many square yards of bunting will it take to make a flag $3\frac{1}{2}$ yd. long and $1\frac{3}{4}$ yd. wide?

3. How many square rods are there in a lot $66\frac{1}{2}$ rd. long and 14 rd. wide?

4. How many square miles are there in a rectangular tract of land $5\frac{1}{4}$ mi. long and $3\frac{1}{2}$ mi. wide?

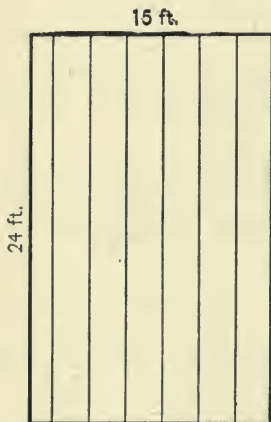
5. How many square yards of oil cloth will it take to cover a floor 15 ft. long and 12 ft. wide ?

6. How many acres are there in a rectangular field 80 rd. long and 20 rd. wide ?

7. How many square yards of plastering are there in the end wall of a room 12 ft. wide and 9 ft. high, if it contains one door $7\frac{1}{2}$ ft. long and 4 ft. wide ?

8. How many shingles are required to cover a roof 20 ft. long and 16 ft. wide, if each shingle covers 20 sq. in. of roof ?

Carpeting.



492. In determining the number of yards of carpet that must be bought to carpet a floor, the number of strips needed should first be found ; a fractional part of a strip should be regarded as a full strip.

493. How many yards of carpet $\frac{3}{4}$ yd. wide must be bought to carpet a floor 24 ft. long and 15 ft. wide, the strips to be laid lengthwise ?

15 ft., or 180 in. = the width of the floor.

$\frac{3}{4}$ yd., or 27 in. = the width of a strip of carpet.

$180 \div 27$, or $6\frac{2}{3}$ = the number of strips needed.

Then, 7 strips must be bought.

24 ft., or 8 yd. = the length of a strip.

Then, 7×8 , or 56 = the number of yards required.

494. Exercise.

1. How many strips of carpet 1 yd. wide must be bought for a room 12 ft. wide, the strips to be laid lengthwise?

2. How many strips of carpet $\frac{3}{4}$ yd. wide must be bought for a room 27 ft. long, the strips to be laid crosswise?

3. How many strips of carpet $\frac{3}{4}$ yd. wide must be bought for a room 20 ft. long, 18 ft. wide:

1st, if the strips are to be laid lengthwise?

2d, if the strips are to be laid crosswise?

4. How many yards of carpet, 1 yd. wide, are needed to cover a floor 12 ft. long and 9 ft. wide?

5. How many yards of carpet, $\frac{3}{4}$ yd. wide, are needed to cover a floor 18 ft. long and $13\frac{1}{2}$ ft. wide?

6. Find the cost of carpeting a floor 24 ft. long and 18 ft. wide with carpet $\frac{3}{4}$ yd. wide, costing \$0.90 per yard, strips to be laid lengthwise.

7. Find the number of yards of carpet $\frac{3}{4}$ yd. wide that must be bought to carpet 40 rooms in a normal school, each 16 ft. long and $11\frac{1}{2}$ ft. wide, strips to be laid lengthwise.

Lumber Measure.

495. Lumber, one or more inches thick, is measured by the board foot.

496. A BOARD FOOT is a piece of lumber one foot long, one foot wide, and one inch thick.

NOTE. A board one inch thick contains as many board feet as it does square feet.

497. Find the number of board feet in a board 16 feet long and 5 in. wide.

16 = the number of feet in the length.

$\frac{5}{12}$ = " " " " " " width.

$\therefore \frac{5}{12} \times 16$, or $\frac{5 \times 16}{12}$ = the number of board feet in the board.

Therefore, to find the number of board feet in a board one inch thick :

Multiply the number of feet in the length by the number of inches in the width and divide by 12.

498. Find the number of board feet in a plank 15 feet long, 7 inches wide, and 2 inches thick.

$\frac{7 \times 15}{12}$ = the number of board feet in the plank, if 1 inch thick.

$\therefore \frac{2 \times 7 \times 15}{12}$ = " " " " " " " " 2 inches thick.

Therefore, to find the number of board feet in a piece of lumber more than one inch thick :

Multiply together the number of feet in the length, the number of inches in the width, and the number of inches in the thickness, and divide by 12.

NOTE 1. Boards less than one inch thick are sold by the square foot.

NOTE 2. The number of board feet in a piece of lumber is spoken of as the number of feet.

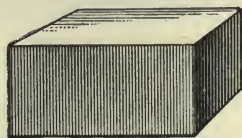
499. Exercise.

1. Find the number of feet in a board 16 ft. by 8 in.
2. Find the number of feet in a plank 15 ft. long, 9 in. wide, and 2 in. thick.
3. Find the number of feet in a piece of scantling 14 ft. long, 4 in. wide, and 3 in. thick.

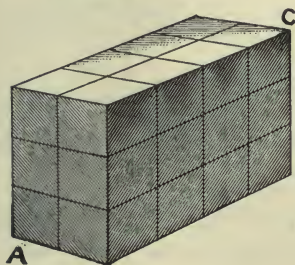
4. How many square feet are there in a board 12 ft. long, 6 in. wide, and $\frac{1}{2}$ of an inch thick?
5. How many feet in the following bill of lumber?
- 8 boards, 18 ft. by 8 in.
10 boards, 16 ft. by 8 in.
12 boards, 14 ft. by 9 in.
6. How many feet in a load of lumber containing the following?
- 3 joists, 16 ft. by 9 in. by 4 in.
4 scantlings, 14 ft. by 4 in. by 3 in.
2 planks, 12 ft. by 8 in. by $2\frac{1}{2}$ in.
8 boards, 18 ft. by 9 in.
7. Find the cost of:
- 6 boards, 16 ft. by 8 in., at \$30 per M (1000 ft.).
8 pieces of scantling, 18 ft. by 4 in. by 3 in., at \$25 per M.
4 planks, 12 ft. by 9 in. by $2\frac{1}{4}$ in., at \$28 per M.

Rectangular Solids.

500. A Rectangular Solid is a solid all of whose faces are rectangles.



A Rectangular Solid.



501. Exercise.

1. How many faces has solid AC? How many of them can you see? What kind of figure is each face? What may the solid be called?

2. AC is divided into equal

cubes. How many of these cubes are there in each row of the upper layer? How many rows are there in the upper layer? How many cubes are there in the upper layer? How many layers of cubes are there in AC?

3. If each cube of AC were a cubic inch, how long would the solid AC be? How wide? How high? How many cubic inches would it contain?

4. What three numbers did you multiply together to get the number of cubes in AC?

5. If the rectangular solid were 4 feet long, 2 feet wide, and 3 feet high, show that the number of cubic feet in it would be $3 \times 2 \times 4$.



502. A pile of wood or stone 8 ft. long, 4 ft. wide, and 4 ft. high is called a **Cord**.

503. Exercise.

1. How many cubic inches are there in a block 5 in. long, 4 in. wide, and 3 in. high?

5 = the number of inches in the length of the block.

4 = " " " " " " width " " "

3 = " " " " " " height " " "

$\therefore 3 \times 4 \times 5$, or $60 =$ the number of cubic inches in the block.

2. How many cubic feet of air are there in a room 12 ft. long, 9 ft. wide, and 8 ft. high?

3. How many cubic yards of earth must be removed in digging a cellar 27 ft. long, 18 ft. wide, and 12 ft. deep?

4. Show that there are 128 cu. ft. in a cord. [See §502.]
5. Show that a wall $16\frac{1}{2}$ ft. long, $1\frac{1}{2}$ ft. thick, and 1 ft. high contains $24\frac{3}{4}$ cu. ft., or 1 perch. [See §485.]
6. Show that a tin vessel 11 in. long, 7 in. wide, and 3 in. deep, holds a gallon. [See §485.]
7. How many gallons of water will a cistern hold that is 28 ft. long, 22 ft. wide, and 12 ft. deep?
8. If 1 bushel equals about $1\frac{1}{4}$ cu. ft., about how many bushels will a granary hold that is 10 ft. long, 8 ft. wide, and 6 ft. deep?
9. If a heaped bushel equals $2\frac{5}{8}$ cu. ft., how many heaped bushels will a cornerib hold that is 25 ft. long, 4 ft. wide, and 10 ft. high?
10. Potatoes are sold by the heaped bushel; about how many bushels of potatoes will a bin hold that is 10 ft. long, 8 ft. wide, and 5 ft. deep?
11. How many cords of wood are there in a pile 256 ft. long, 4 ft. wide, and 4 ft. high?

Compound Denominate Amounts.

504. Find the sum of 4 bu. 3 pk. 2 qt., 3 bu. 1 pk. 5 qt., and 2 bu. 2 pk. 6 qt.

			The sum of the quarts is 13 qt., or 1 pk.
bu.	pk.	qt.	5 qt. Write 5 under the quarts and add 1 pk.
4	3	2	to the pecks. The sum of the pecks is 7 pk.,
3	1	5	or 1 bu. 3 pk. Write 3 under the pecks and
2	2	6	add 1 bu. to the bushels. The sum of the
<hr/>			bushels is 10 bu.
10	3	5	

\therefore The sum is 10 bu. 3 pk. 5 qt.

505. From 20 yr. 6 mo. 18 da. take 14 yr. 8 mo. 14 da.

yr.	mo.	da.	14 da. from 18 da. leaves 4 da. Write 4
20	6	18	under the days. We cannot take 8 mo. from
14	8	14	6 mo., so we take 1 yr., or 12 mo., from 20 yr.
<u>5</u>	<u>10</u>	<u>4</u>	(leaving 19 yr.) and add it to 6 mo., making
			18 mo. 8 mo. from 18 mo. leaves 10 mo. Write
			10 under the months. 14 yr. from 19 yr. leaves
			5 yr.

∴ The difference is 5 yr. 10 mo. 4 da.

506. A man who was born Feb. 10, 1872 and died Aug. 17, 1903, lived to what age?

yr.	mo.	da.	He was born on the 10th day of the 2d
1903	8	17	month of the year 1872, and died on the 17th
1872	2	10	day of the 8th mo. of the year 1903.
<u>31</u>	<u>6</u>	<u>7</u>	∴ 1903 yr. 8 mo. 17 da. — 1872 yr. 2 mo.
			10 da., or 31 yr. 6 mo. 7 da., was the age to
			which he lived.

507. Exercise.

Add: 1.

ft. in.

3 8

6 9

9 10

Add: 3.

T. cwt. lb.

2 13 48

1 7 82

2 8 10

Add: 2.

lb. oz. pwt.

3 9 5

4 8 12

5 10 16

4.

gal. qt. pt.

From 10 2 0

take 6 3 1

5.		6.		
cu. yd.	cu. ft.	yd.	ft.	in.
From 25	10	From 16	2	3
take 14	24	take 8	2	9

7. In one bag there are 2 bu. 3 pk. of potatoes, and in another 1 bu. 2 pk.; what is the amount of potatoes in the two bags?

8. A keg contained 5 gal. 2 qt. of cider, but 2 gal. 3 qt. has been drawn off; how much remains?

9. A man was born Jan. 12, 1882, and had his life insured on Feb. 9, 1902; how old was he when his life was insured?

10. George Washington was born Feb. 22, 1732, and died Dec. 14, 1799; how old was he when he died?

11. Daniel Webster was born Jan. 18, 1782, and died Oct. 24, 1852; how old was he when he died?

12. William Penn was born Oct. 14, 1644, and died July 30, 1718; how old was he when he died?

13. Henry Clay died June 29, 1852, at the age of 75 yr. 2 mo. 17 da.; when was he born?

508. Reduce 3 gal. 2 qt. 1 pt. to pints.

$$3 - 2 - 1.$$

$$\begin{array}{r} 4 \\ \hline 12 \\ 2 \\ \hline 14 \\ 2 \\ \hline 28 \\ 1 \\ \hline 29 \end{array}$$

$$1 \text{ gal.} = 4 \text{ qt.}$$

$$3 \text{ gal.} = 3 \times 4 \text{ qt., or } 12 \text{ qt.}$$

$$3 \text{ gal. } 2 \text{ qt.} = 12 \text{ qt.} + 2 \text{ qt., or } 14 \text{ qt.}$$

$$1 \text{ qt.} = 2 \text{ pt.}$$

$$14 \text{ qt.} = 14 \times 2 \text{ pt., or } 28 \text{ pt.}$$

$$\therefore 3 \text{ gal. } 2 \text{ qt. } 1 \text{ pt.} = 28 \text{ pt.} + 1 \text{ pt., or } 29 \text{ pt.}$$

509. Exercise.

1. Reduce 7 lb. 2 oz. (avoir.) to ounces.
2. Reduce 4 T. 8 cwt. to hundredweight.
3. Reduce 4 da. 8 hr. to hours.
4. Reduce 4 A. 30 sq. rd. to square rods.
5. Reduce 12 pwt. 10 gr. to grains.
6. Reduce 2 mi. 18 rd. to rods.
7. Reduce 4 bu. 2 pk. 6 qt. to quarts.
8. Reduce 2 yd. 2 ft. 6 in. to inches.

510. Reduce 149 pt. to gallons, etc.

$$\begin{array}{rcl}
 2 \overline{) 149} & \frac{1}{4} \text{ of the number of pt.} = \text{the number of qt.} & \\
 \underline{4 \overline{) 74}^1} & \therefore 149 \text{ pt.} = 74 \text{ qt. 1 pt.} & \\
 18^2 & \frac{1}{4} \text{ of the number of qt.} = \text{the number of gal.} & \\
 & \therefore 74 \text{ qt.} = 18 \text{ gal. 2 qt.} & \\
 & \text{Hence, } 149 \text{ pt.} = 18 \text{ gal. 2 qt. 1 pt.} &
 \end{array}$$

511. Exercise.

1. Reduce 3675 sec. to hours, etc.
2. Reduce 500 gi. to gallons, etc.
3. Reduce 150 qt. to bushels, etc.
4. Reduce 4875 lb. to tons, etc.
5. Reduce 275 pt. to gallons, etc.
6. Reduce 2000 yd. to miles, etc.

CHAPTER V.

PERCENTAGE.

512. Instead of saying *five hundredths* of a number, we may say *five per cent* of a number.

Per cent means *hundredths*.

Thus, 1 per cent of a number is $\frac{1}{100}$, of it.

4 per cent of a number is $\frac{4}{100}$, or $\frac{1}{25}$ of it.

25 per cent of a number is $\frac{25}{100}$, or $\frac{1}{4}$, of it.

100 per cent of a number is $\frac{100}{100}$, or once, the number.

200 per cent of a number is $\frac{200}{100}$, or twice, the number.

250 per cent of a number is $\frac{250}{100}$, or $2\frac{1}{2}$ times, the number.

$12\frac{1}{2}$ per cent of a number is $\frac{12\frac{1}{2}}{100}$, or $\frac{1}{8}$, of it.

513. The sign % stands for *per cent*.

Thus, 5 per cent of 50 may be expressed 5 % of 50.

514. Oral Exercise.

What part of a number is :

- | | | |
|-----------------|-----------------|------------------|
| 1. 2 % of it ? | 5. 15 % of it ? | 9. 30 % of it ? |
| 2. 4 % of it ? | 6. 40 % of it ? | 10. 80 % of it ? |
| 3. 10 % of it ? | 7. 50 % of it ? | 11. 90 % of it ? |
| 4. 20 % of it ? | 8. 75 % of it ? | 12. 45 % of it ? |

515. Oral Exercise.

Express as a per cent :

- | | | | | | |
|--------------------|--------------------|--------------------|---------------------|----------------------|---------------------|
| 1. $\frac{1}{2}$. | 3. $\frac{1}{5}$. | 5. $\frac{3}{5}$. | 7. $\frac{3}{10}$. | 9. $\frac{3}{2}$. | 11. $\frac{1}{8}$. |
| 2. $\frac{1}{4}$. | 4. $\frac{3}{4}$. | 6. $\frac{4}{5}$. | 8. $\frac{7}{10}$. | 10. $1\frac{1}{2}$. | 12. $\frac{1}{3}$. |

516. Find 5 % of 40.

5% of 40 = $\frac{5}{100}$, or $\frac{1}{20}$, of 40, or 2.

517. Oral Exercise.

Find :

- | | | |
|----------------|-----------------|----------------------------------|
| 1. 1 % of 200. | 8. 4 % of 100. | 15. 25 % of \$16. |
| 2. 50 % of 12. | 9. 40 % of 15. | 16. $12\frac{1}{2}$ % of \$0.40. |
| 3. 25 % of 8. | 10. 60 % of 50. | 17. 4 % of \$200. |
| 4. 20 % of 35. | 11. 30 % of 30. | 18. 2 % of \$1000. |
| 5. 10 % of 70. | 12. 90 % of 90. | 19. 100 % of \$2. |
| 6. 5 % of 80. | 13. 75 % of 24. | 20. 200 % of \$1.50. |
| 7. 2 % of 150. | 14. 8 % of 50. | 21. 300 % of \$3. |

518. 2 is 25% of what number ? $2 = \frac{25}{100}$, or $\frac{1}{4}$, of the required number. $\therefore \frac{1}{4}$ of the required number $= 4 \times 2$, or 8.**519. Oral Exercise.**

Find the number of which :

- | | | |
|---------------------------|----------------|------------------------------|
| 1. 6 is 50%. | 6. 14 is 200%. | 11. 10 is $12\frac{1}{2}$ %. |
| 2. 8 is 25%. | 7. 4 is 80%. | 12. 15 is 75%. |
| 3. 3 is 20%. | 8. 20 is 400%. | 13. 1.5 is 50%. |
| 4. $2\frac{1}{2}$ is 10%. | 9. 18 is 60%. | 14. $\frac{3}{8}$ is 60%. |
| 5. 5 is 1%. | 10. 36 is 90%. | 15. 8 is $33\frac{1}{3}$ %. |

520. What per cent of 20 is 8 ? $8 = \frac{8}{20}$, or $\frac{2}{5}$, of 20. $\therefore 8 = \frac{2}{5}$ of 100 % of 20, or 40 % of 20.**521. Oral Exercise.**

What per cent of :

- | | | |
|---------------|---------------|--------------------------------------|
| 1. 4 is 2 ? | 6. 100 is 5 ? | 11. 50 is 40 ? |
| 2. 5 is 3 ? | 7. 30 is 6 ? | 12. 80 is 60 ? |
| 3. 10 is 1 ? | 8. 200 is 4 ? | 13. 1 is $\frac{1}{2}$? |
| 4. 75 is 25 ? | 9. 2 is 4 ? | 14. 5 is $2\frac{1}{2}$? |
| 5. 50 is 2 ? | 10. 9 is 9 ? | 15. $\frac{1}{2}$ is $\frac{1}{4}$? |

522. Oral Exercise.

1. How much is 20% of \$20 ?
2. How much is 4% of 50 ct.?
3. A farmer sold 50% of 80 bu. of wheat ; how much wheat did he sell ?
4. \$18 is $\frac{3}{4}$ of what sum ? 75% of what sum ?
5. \$20 is $\frac{4}{5}$ of what sum ? 80% of what sum ?
6. 2 yd. is 50% of what length ?
7. 2 lb. is 5% of what weight ?
8. 50 ct. is 2 times what sum ? 200% of what sum ?
9. 6 ft. is 3 times what length ? 300% of what length ?
10. 25 lb. is 200% of what weight ?
11. 1 qt. is what part of 4 qt. ? What per cent of 4 qt.?
12. \$2 is what part of \$4 ? What per cent of \$4 ?
13. 8 ct. is what part of 20 ct. ? What per cent of 20 ct.?
14. 1 pk. is what part of 1 bu. ? What per cent of 1 bu.?
15. 10 ct. is what part of \$1 ? What per cent of \$1 ?
16. 6 ct. is what part of \$1 ? What per cent of \$1 ?

523. Oral Exercise.

1. A boy was given 50 words to spell ; if he spelled 80% of them correctly, how many did he spell correctly ?
2. 75% of a class of 40 pupils were promoted ; how many were promoted ?
3. A dealer bought a horse for \$200 and sold him so as to gain 20% of the cost ; what did he receive for him ?

4. A farmer's corn crop was 160 bu.; he used $37\frac{1}{2}\%$ of it and sold the remainder; how many bushels did he sell?

5. A piece of silverware weighing 8 oz. is $62\frac{1}{2}\%$ pure silver; how many ounces of silver does it contain?

6. A merchant asked \$6 for a coat, but sold it at 20% below this price; what did he receive for it?

7. A boy spelled correctly 20 words, which were 80% of the number given him; how many were given him?

8. A man earned \$40 collecting bills that were overdue; how much did he collect, if he was paid 25% of the sum collected?

9. After a man sold 60% of his land, he had left 20 A.; how much had he at first?

10. A laborer's wages were increased from \$10 to \$12 a week; find the per cent of increase.

11. What per cent should a girl receive who spells correctly 20 words of the 25 given?

12. A boy attended school 15 days out of 20 during a certain month; find the per cent of his attendance.

13. A merchant who buys oil at 8 ct. a gallon and sells it at 10 ct. a gallon, gains what per cent of the cost?

524. A dealer bought a horse for \$175 and sold him at a gain of 15% of the cost; find the gain.

$$\begin{array}{r}
 \$175 \\
 .15 \\
 \hline
 875 \\
 175 \\
 \hline
 \$26.25
 \end{array}$$

\$175 = the cost.

15%, or .15, of the cost = the gain.

$\therefore .15 \times \$175$, or \$26.25 = the gain.

525. Exercise.

1. A man had \$250 in bank and withdrew 20% of it; how much did he withdraw?

2. A dealer bought a cow for \$42 and sold her at a gain of $37\frac{1}{2}\%$ of the cost; find the selling price.

SUG. $37\frac{1}{2}\%$ of a number = .375 of it.

3. Milk yields butter to the extent of about 4% of its weight; how much butter will 175 lb. of milk yield?

4. 10% of all silver coin is copper; find the weight of the copper in a silver dollar, which weighs 412.5 gr.

5. A merchant agreed to settle some outstanding bills amounting to \$385.25 for 75% of their full amount; how much did he lose?

6. A merchant asked \$6.25 for a coat, but sold it for 60% of the price asked; how much did he receive for it?

7. A dealer bought a china dinner set for \$37.50 and asked for it 20% more than the cost; find the price asked.

8. A farmer had 672 bu. of oats, but sold $16\frac{2}{3}\%$ of it and fed 25% of the remainder; how many bushels had he left?

526. A dealer sold a horse at a gain of \$30.60, which was 15% of its cost; find the cost.

.15) \$30.60 (\$204

$$\begin{array}{r} 30 \\ \hline 60 \\ 60 \\ \hline \end{array}$$

\$30.60 = the gain.

15%, or .15, \times cost = the gain.

$\therefore .15 \times \text{cost} = \$30.60.$

Cost = $\$30.60 \div .15$, or \$204.

527. Exercise.

1. A merchant failing in business paid 75% of his debts; if he paid \$3757.80, what were his debts?

2. A dealer sold a machine for \$126, which was 90% of the cost; find the cost.

3. A jeweler sold a clock for \$15.50, which was 80% of the price he asked for it; what did he ask for it?

4. An agent earned \$275.50 by collecting rents, being paid 2% of the sum collected; how much did he collect?

5. A suit of clothes was sold for \$2.25 more than it cost, which was at a gain of 12% of the cost; find the cost.

6. A merchant sold a bureau for \$24, which was 80% of the price he asked; what was the price asked?

7. If milk yields 4% of its weight of butter, how many pounds of milk will yield 150 lb. of butter?

8. A farmer sold 437.5 bu. of wheat, which was $87\frac{1}{2}\%$ of his wheat crop; find his wheat crop.

SUG. $87\frac{1}{2}\%$ of his crop = $.875 \times$ his crop.

528. A clerk who earned \$640 a year, paid \$96 a year for house rent; what per cent of his salary did he pay for house rent?

6.40)96.0(15

\$640 = his salary.

64 .01 of \$640, or \$6.40 = the rent, if it were 1% of the
320 salary.

320 \therefore \$96: \$6.40, or 15 = the number of per cent required.

529. Exercise.

1. If in 300 lb. of corn there are 16.2 lb. of fat, what is the per cent of fat in corn?

2. A music dealer bought a second-hand piano for \$275 and sold it at a gain of \$49.50; what per cent of the cost did he gain?

3. A marketman sold for a merchant \$78 worth of poultry, charging \$3.90 for making the sale; what per cent of the selling price was charged?

4. A lawyer collected a debt of \$1200, charging \$150 for making the collection; what per cent of the debt did he charge?

5. I bought a bill of goods amounting to \$112.50, but the merchant deducted \$4.50 from it for cash payment; what per cent of the bill did he deduct?

6. A shoe dealer paid \$3 for a pair of gum boots, and sold them for \$2.40; what per cent of the cost did he lose?

7. A hardware dealer bought nails at \$2.40 a keg and sold them at \$2.80 a keg; what per cent of the cost did he gain?

8. A butcher bought pork at \$5.40 per cwt. and sold it at \$6.30 per cwt.; what per cent of the cost did he gain?

Interest.

530. If a person borrows money he usually has to pay a certain per cent of the sum borrowed for the use of it each year.

Money paid for the use of money is called **Interest**.

The sum on which interest is paid is called the **Principal**.

Thus, if a man borrows \$100 for 2 years and has to pay 5% of this sum for the use of it each year, he must pay 2 times 5% of \$100, or \$10, for the use of it for 2 years. Here \$10 is the *interest* and \$100 the *principal*.

531. Oral Exercise.

What is the interest on:

- | | |
|--|--|
| 1. \$100 for 1 yr. at 6%? | 6. \$500 for $2\frac{1}{2}$ yr. at 6%? |
| 2. \$200 for 1 yr. at 5%? | 7. \$250 for $\frac{1}{2}$ yr. at 4%? |
| 3. \$600 for 2 yr. at 4%? | 8. \$800 for $1\frac{1}{4}$ yr. at 4%? |
| 4. \$300 for 3 yr. at 6%? | 9. \$600 for $2\frac{2}{3}$ yr. at 3%? |
| 5. \$100 for $2\frac{1}{2}$ yr. at 4%? | 10. \$600 for 1 mo. at 6%? |

532. The time for which interest is paid is usually reckoned in *years and days, when it exceeds a year; and in days only when it is less than a year, the exact number of days being counted.*

Thus, if a sum of money is on interest from Jan. 2, 1901 to March 1, 1903, the time is counted as follows: from Jan. 2, 1901 to Jan. 2, 1903 is 2 yr.; and from Jan. 2, 1903 to Mar. 1, 1903 is 58 da., making in all 2 yr. 58 da. Again, if a sum of money is on interest from Mar. 1, 1903 to Oct. 1, 1903, the time is 214 da.

533. Interest for time less than a year is usually reckoned on the basis of 360 da. to the year.

Thus, in reckoning interest on a sum for 108 da., the time is usually regarded as $\frac{108}{360}$ yr.

534. Find the interest on \$175 from May 1, 1901 to Sept. 1, 1903, at 4%.

\$175	The time from May 1, 1901 to May 1, 1903 = 2 yr.
.04	The time from May 1, 1903 to Sept. 1, 1903 =
<hr/>	(30 + 30 + 31 + 31 + 1) da. = 123 da.
\$7.00	\therefore The time the principal is on interest =
$2\frac{41}{120}$	2 yr. 123 da. = $2\frac{41}{120}$ yr.
<hr/>	.04 \times \$175, or \$7 = the interest for 1 yr.
\$14.00	$2\frac{41}{120} \times \$7$, or \$16.39 $\frac{1}{6}$, or \$16.39 = the required
2.39 $\frac{1}{6}$	interest.
<hr/>	
\$16.39 $\frac{1}{6}$	

535. Exercise.

Find the interest on:

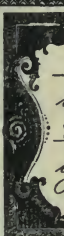
1. \$50 for 2 yr. at 6%.
2. \$75 for 3 yr. at 4%.
3. \$150 for 2 yr. at $4\frac{1}{2}\%$.
4. \$350 for 90 da. at 3%.
5. \$275.60 for 270 da. at $4\frac{1}{2}\%$.
6. \$385.75 for 200 da. at 3%.
7. \$75 for 2 yr. 210 da. at 4%.
8. \$85.50 for 3 yr. 20 da. at $4\frac{1}{2}\%$.
9. \$145 from Sept. 15, 1902 to Dec. 1, 1903, at 5%.
10. \$850.60 from May 1, 1901 to Sept. 1, 1903, at $4\frac{1}{2}\%$.
11. \$205.25 from Jan. 2, 1902 to March 1, 1904, at 4%.

SUG. The time = 2 yr. 59 da. Why?

12. \$850.75 from May 1, 1903 to Dec. 31, 1903, at 5%.

BUSINESS PAPERS.

A PROMISSORY NOTE.

	\$ 45 ²⁵ / ₁₀₀	Newark, N. J. Sept. 1, 1903
	Sixty days after date I promise to pay to	
	the order of Leo Morris Philip	
	Forty-five	²⁵ / ₁₀₀ Dollars
	at The First National Bank	
Value received		
No. 25 Due Oct. 31, '03		A. P. Reid


536. A Promissory Note is a written promise to pay a specified sum to a certain party at a certain time.

on the day he receives it, or on the first business day following.

540. Before the holder of a check has it cashed, he must write his name across the back of it. This is called *indorsing* the check.

James E. Henderson.

A RECEIPT.

	Received of	Danbury Conn. Sept. 1, 1903
		John F. Stine
	Twenty-five	45/100 Dollars
	in full of all accounts to date	
\$ 25.45		Robert S. Wilson.

541. A Receipt is a written acknowledgment of money or goods received, or of services rendered.

NOTE. When the money paid is only part of the debt owed, "*on account*" should be written in the receipt instead of "*in full of all accounts to date.*"

542. Exercise.

1. When is the note on p. 249 due ?
2. When is a note due that is dated July 1, and payable in 60 da. ?
3. When is a note due that is dated May 1, and payable in 3 mo. ?

4. Who pays the note on p. 249, when due ?
5. Write a promissory note for \$25 with yourself as maker and L. M. Morris as payee, dating the note June 1, 1903, and making it payable in 90 da.
6. Suppose you buy a cow from F. P. Haws for \$45.50, payable in 6 mo.; write the promissory note that you could give him in payment.
7. Suppose you have money deposited in the Central National Bank of Wilmington, Del.; write the check with which you could pay Joseph S. Walton \$10. Show how Joseph S. Walton would indorse the check before having it cashed.
8. Write a receipt showing that C. V. Miller paid you \$75 to-day on account.
9. Write a receipt for \$40 wages that were due you for the month of June, 1903, from L. M. Haines, and paid the last day of that month.

MISCELLANEOUS PROBLEMS.

543. Oral Exercise.

1. After a young man's salary had been increased $\frac{1}{10}$ of itself, it was \$5.50 per week ; what was it before the increase ?
2. How many times is $\frac{2}{3}$ contained in 1 ?
3. \$1,000,000 is how many times \$100,000 ?
4. If an automobile runs 12 mi. per hour, in how many minutes will it run a mile ?

5. What will it cost to send by mail a book weighing 19 oz., the rate of postage being 1 ct. for 2 oz. or fraction thereof?

6. If the cost of sending a telegram is 25 ct. for the first 10 words and 2 ct. for each additional word; find the cost of sending the following message: "Meet me at my office to-morrow morning. Bring books. Important meeting."

7. What should 1 doz. loaves of bread cost when 3 loaves cost 10 ct.?

8. Supply the missing numbers and read:

275 rails = — hundred rails.

87.5 pounds = — hundred pounds.

2735 shad = — hundred shad.

7567 plants = — thousand plants.

544. Exercise.

[From United States Civil Service Examinations.]

1. Divide 2,408,588 by 4,732.

2. Multiply 8,643 by 608, and then subtract 98,746.

3. A merchant who spent \$225, bought 65 pounds of butter at 30 cents per pound, 84 barrels of apples at \$2.25 per barrel, and spent the remainder for coffee. How much did he spend for coffee?

4. During the month of August 450,000 bushels of wheat were shipped from a certain port. During September 87,960 more bushels were shipped than during August. What was the total number of bushels shipped in the two months?

5. Add the following, placing the total at the bottom :

$$\begin{array}{r} 742,155.74 \\ 429.39 \\ 6,873.68 \\ 397.49 \\ \hline 1,956,374.20 \end{array}$$

6. If a railway mail clerk earns \$800 in a year, how much will he have left after paying his board at the rate of \$16 a month?

7. If a railway mail clerk spends ten cents a day for street-car fare, how much will he spend in six months of 30 days each?

545. Exercise.

1. If 4 men can do a piece of work in $8\frac{1}{2}$ da., how long should it take 1 man to do it?

2. If $\frac{5}{6}$ of a number is $12\frac{1}{2}$, what is $\frac{3}{4}$ of the number?

3. What date is 30 da. prior to Dec. 31?

4. A roll of wall paper is 8 yd. long and 18 in. wide; how many square feet does it contain?

5. What decimal taken 100 times will make .1?

6. How many 2-inch squares can be cut from a piece of pasteboard 6 in. long and 5 in. wide? How many square inches of waste will there be?

7. How many square feet of canvas is required to cover a box 6 ft. 6 in. long, 4 ft. wide, and 3 ft. deep?

8. What must be added to .001 to make .1?

9. A man who takes on an average 110 steps per minute, each step $2\frac{1}{2}$ ft. long, is walking at the rate of how many miles per hour?

10. A rectangular piece of land containing 1 A. is 80 yd. long; find its width in yards.

11. A man bought a piece of oil cloth containing 20 sq. yd.; what is its length, if it is $1\frac{1}{4}$ yd. wide?

546. Exercise.

1. A man who was born 60 years ago has lived how many hours, supposing that there have been 14 leap years in the 60 years?

2. How many yards long is a tract of land containing an acre, if it is 20 yards wide?

3. $2\frac{1}{2}$ doz. hats cost \$72; what should they sell for apiece in order that the gain may be \$1 on each hat?

4. How much waste will there be after cutting as many 2-inch cubes as possible out of a 5-inch cube?

5. A common brick is 8 in. long, 4 in. wide, and 2 in. thick; how many square inches are there in its surface?

6. A mechanic was employed for 1 year at \$60 a month; if his expenses were \$32 a month, how much did he save during the year?

7. Find the total length of the edges of a box 6 in. long, 4 in. wide, and 3 in. high.

8. 12 bu. of wheat were raised on a piece of land 121 yd. long and 10 yd. wide; at the same rate, what would be the yield on an acre?

9. Show by an arrangement of dots that $3 \times 2 = 2 \times 3$.

547. Exercise.

[From United States Civil Service Examinations.]

1. Multiply $7\frac{2}{5}$ by 36.8, and divide the product by 1.92. (Solve by decimals.)

2. A lot which was 53 feet wide and 150 ft. long sold for \$8347.50, which was one-fourth more than it cost. What was the cost per square foot?

3. Multiply 382.58 by $\frac{3}{4}$ of 27,342, and divide the product by $\frac{1}{2}$ of 34.78. (Work by decimals.)

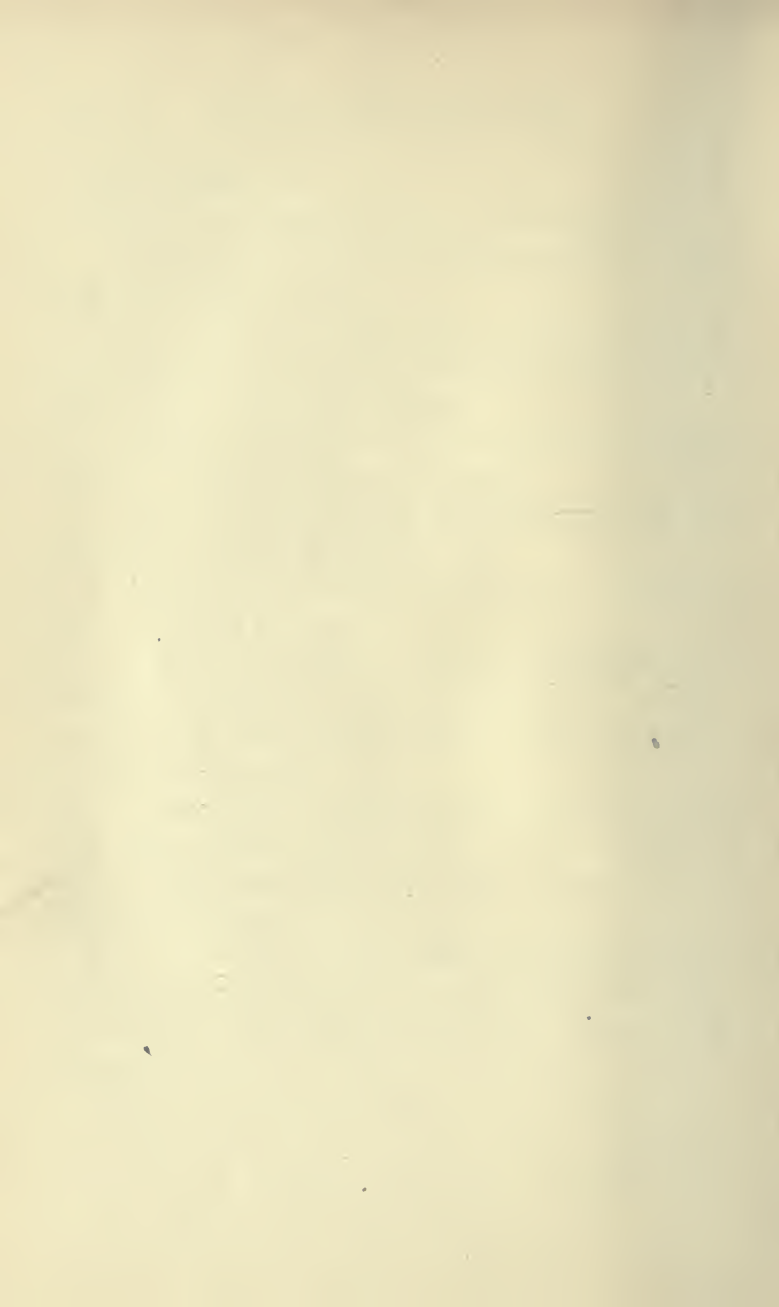
4. Divide $5\frac{2}{3}$ by $\frac{9}{32}$, multiply the quotient by 3.5468, and from the product subtract $1\frac{1}{6}$ of 13.76.

5. Multiply $37\frac{2}{5}$ by 400.3, and divide the product by 93.5. (Solve by decimals.)

6. A carrier can assort 43 letters or 37 papers in a minute. At this rate, how many hours will it take him to assort 3655 letters and 185 pounds of papers, averaging 7 papers to the pound?

7. In a certain mail there are 294 pounds 14 ounces of newspapers weighing at the rate of 3 papers to every 7 ounces. How many papers are there in the mail? (16 ounces = 1 pound.)

8. If a cubic foot of coal weighs 63 pounds, find the number of tons of coal in a bin 5 feet 6 inches wide, 6 feet 9 inches deep, and 19 feet 6 inches long. (1 ton = 2,240 pounds.)





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Calculus

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